NS 1.42:980
US GOVERNMENT PUBLICATIONS (depository)
National Science Foundation
Science & engineering personnel 1980
Mar 83-7949
1 of 1
p.0001-0049
READEX

1982

COMPLETED
60

science and engineering personnel: a national overview

national science foundation
NSF 80-316

related publications

Science Resources Studies Highlights

	NSF Number	Price
"Employment of Scientists and Engineers Increased Between 1976 and 1978 But Declined in Some Science Fields"	80-305	-----
"Work Activities of Doctoral Scientists and Engineers Show Substantial Change Between 1973 and 1977"	78-316	-----

Detailed Statistical Tables

U.S. Scientists and Engineers, 1978	80-304	-----
Characteristics of Experienced Scientists and Engineers, 1978	79-322	-----
Characteristics of Doctoral Scientists and Engineers in the United States, 1977	79-306	-----
U.S. Scientists and Engineers, 1976	79-305	-----
Characteristics of Experienced Scientists and Engineers, 1976	78-305	-----

Reviews of Data on Science Resources

"Employment Characteristics of Recent Science and Engineering Graduates: The Effects of Work Experience, Advanced Degrees, and Business Cycles"	80-311	$1.50
"Employment Patterns of Recent Entrants Into Science and Engineering"	78-310	$0.80

Reports

Occupational Mobility of Scientists and Engineers	80-317	In press
Projections of Science and Engineering Doctorate Supply and Utilization, 1982 and 1987	79-303	$2.25

Availability of Publications

Those publications marked with a price should be obtained directly from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402. Where no price is listed, single copies may be obtained gratis from the National Science Foundation, Washington, D.C. 20550.

(See inside back cover for Other Science Resources publications.)

BEST DOCUMENT AVAILABLE

science and engineering personnel: a national overview

national science foundation
NSF 80-316

I BEST DOCUMENT AVAILABLE

For sale by the Superintendent of Documents, U.S. Government Printing Office
Washington, D.C. 20402

BEST DOCUMENT AVAILABLE

foreword

Scientists and engineers are a critical ingredient in the Nation's scientific and technological activities. It is therefore not surprising that information on these valuable human resources is in strong demand by a variety of decisionmakers. The National Science Foundation has traditionally been meeting this demand through its various publications. Thus, besides the *Science Resources Studies Highlights* and the Detailed Statistical Tables, the Foundation has been issuing a series of regular, full reports providing information on science and engineering (S/E) personnel from each of its ongoing surveys. In addition, it has been issuing special analytic publications in which information derived from a variety of data sources has been drawn together to illuminate particular facets of the technical labor market.

In recent years, however, the need for a single comprehensive national overview document has become increasingly apparent. This report attempts to provide such a perspective. It begins with an integrated overview of current utilization and supply patterns for all U.S. scientists and engineers, continues with a detailed examination of the status of doctoral scientists and engineers, and concludes with an examination of the dynamics of the S/E labor market—i.e., the flows into and out of science and engineering. Appendix tables provide a comprehensive summary of data on S/E personnel and should be of special utility to analysts. These tables will be maintained and updated in successive editions. Analyses of current interest will continue to be presented, although they may vary from volume to volume.

It is expected that this publication will be a useful complement to the National Science Board's periodic *Science Indicators* series and to the recently inaugurated *National Patterns of Science and Technology Resources* series, which are also prepared by the Division of Science Resources Studies. Like any new endeavor, this initial volume leaves room for modification and improvement; accordingly, constructive critiques and suggestions are encouraged so that future volumes will continue to reflect the information needs of policymakers, analysts, and other students of American science and technology.

Charles E. Falk
Director, Division of Science
Resources Studies
Directorate for Scientific, Technological,
and International Affairs

June 1980

BEST DOCUMENT AVAILABLE

acknowledgments

This report was developed by Michael F. Crowley, Senior Staff Associate for Methods and Analysis, Scientific and Technical Personnel Studies Section (STPSS). Significant contributions to the report were provided by Joel Barries, Morris Cobern, and John Scopino assisted by Larry Lacy and Melissa J. Lane, all of STPSS. Useful comments were received from William Stewart, Head, R&D Economics Studies Section.

Supervision, review, and guidance were provided by:
Alan Fechter, Head, Scientific and Technical Personnel Studies Section
Charles E. Falk, Director, Division of Science Resources Studies

BEST DOCUMENT AVAILABLE

contents

Summary vi

Introduction ix

Chapter I. Current Utilization and Supply Patterns of Scientists and Engineers 1
- Highlights 1
- S/E Employment 2
- Shifts in Sectoral Employment Patterns 2
  - Business/Industry 2
  - Educational Institutions 2
  - Federal Government 3
- Work Activities 3
- Women 4
- Minorities 4
- Potential Supply 4
- The S/E Labor Force 5
- Labor Market Indicators 5
- S/E Salaries 7

Chapter II. Doctoral Scientists and Engineers 8
- Highlights 8
- Employment Status 9
  - By Field 9
  - By Sector 9
  - Work Activities 10
  - Labor Market Balance 10
- Women 11
  - Employment 11
  - Supply/Utilization 12
- Minorities 12
  - Employment 12
  - Supply/Utilization 12
- Projected Supply and Utilization 13
  - Supply 13
  - Utilization 14

Chapter III. The Dynamics of Science and Engineering Labor Markets 15
- Highlights 15
- S/E Flows 16
- New Entrants 16
  - Market and Demographic Factors and Overall Degree Production 16
  - The Propensity to Attend Graduate School 18
  - S/E Degree Field 20
  - Transition from School to Work 20
- Other Entrants 22
- Occupational Mobility 22
- Losses to the S/E Labor Market 23
- Estimates of 1980 S/E Labor Market Conditions 23
  - Supply 24
  - Utilization 24

Appendixes:
- A. Technical Notes 26
- B. Statistical Tables 28

BEST DOCUMENT AVAILABLE

summary

employment opportunities

Employment of scientists and engineers in 1978 showed general improvement over 1976, but these improvements were not shared equally among all fields, among all race and sex groups, at all degree levels, or in all sectors of the economy. Science and engineering (S/E) employment increased by 4 percent between 1976 and 1978, in contrast with the 8-percent rate of the total work force.

Employment in S/E jobs increased for engineers, but fell for scientists between 1976 and 1978. Except for computer specialists, who had a growth rate of over 30 percent, and environmental scientists up 20 percent, employment fell in all major fields of science. These data reflect a relatively strong demand for engineers, computer specialists, and environmental scientists.

The 1978 employment experience of recent (1976) S/E baccalaureates supports the evidence of strong employment demand in these fields. Of those with degrees in engineering and computer science, four-fifths found employment in occupations matching their degree field. In contrast, less than 15 percent of the mathematics and social science degree-holders found such jobs.

Although the data on employment in S/E jobs suggest that job opportunities for scientists in some fields of specialization have been limited in recent years, scientists had no real difficulty in finding work. Total employment for scientists (in any type of job) increased more rapidly than total employment for engineers—6.0 percent vs. 2.2 percent. However, all of the employment growth for scientists occurred in non-S/E jobs, while for engineers, the growth was in S/E positions.

Women and black scientists and engineers experienced greater than average improvements in total employment opportunities—i.e., in either S/E or non-S/E jobs. Employment of women increased by 17 percent compared to 3 percent for men. Although S/E women have been increasingly successful in entering the work force, they still represented only 9.5 percent of S/E employment. Employment of black scientists and engineers grew by 10 percent between 1976 and 1978, compared to an overall 4-percent S/E growth rate. Thus, the black share of the work force increased slightly to 2 percent.

The S/E doctorates group was another major beneficiary of the improved employment opportunities. Here, employment grew by 10 percent in the late seventies, faster than the overall rate of 4 percent. This indicates that the quality of the S/E work force, measured by level of degree attainment, is being enriched. The reasons for this degree upgrading could be a screening of jobs among an excess supply of applicants and/or a true increase in the skill requirements of jobs in these areas. This recent S/E doctorate rate of growth, less rapid than the 16 percent experienced in the midseventies, resulted primarily from the slower growth in the academic sector, a major employer of S/E doctorates. The recent tapering off of enrollment increases caused this slowdown. Demographic projections indicate that this enrollment trend is likely to continue through the mideighties and may actually become a decline. The projected stagnation in academic employment, combined with the current age composition of employed tenured faculty, points toward poorer future employment opportunities in this sector for graduating Ph.D. scientists and engineers.

BEST DOCUMENT AVAILABLE

The 1976-78 S/E employment growth took place largely in the industry sector of the economy, where employment grew by almost 7 percent. In contrast, a less than 3-percent growth rate was experienced by those employed in educational institutions and a levelling-off, or decline, was experienced by those in the Federal Government or other sectors of the economy. The rapid growth in the industry sector resulted from the post-1976 recovery of economic activity and recent increases in real levels of industrial R&D expenditures. The slower employment growth in educational institutions was primarily the result of demographic factors forcing academic employers to reduce their rates of hiring. This slowdown has been concentrated among institutions not granting S/E degrees, primarily 2-year colleges. Statistics on part-time S/E employment and utilization of scientists and engineers on nontenure track jobs offer further evidence of the declining employment opportunities in academia. Both types of employment have been growing as a proportion of total academic employment, indicating the lack of tenure-track job openings.

S/E employment growth for those primarily employed in research and development during the 1976-78 period was more rapid than comparable increases in non-R&D activities—9 percent vs. 2 percent.

s/e labor market balance

A frequently used indicator of balance between employment opportunities and the available supply of scientists and engineers is the unemployment rate. Between 1976 and 1978 the S/E unemployment rate fell from 3.0 percent to 1.4 percent. This decline was proportionately larger than the comparable decline for the total civilian labor force where unemployment dropped from 7.7 percent to 6.0 percent.

Unemployment rates, however, cannot be used as the only indicator of supply/demand balance, especially for occupations such as science and engineering. Even though the high level of educational attainment generally associated with S/E occupations assures low unemployment rates, still a significant number of working scientists and engineers could be involuntarily employed in non-S/E jobs. Such involuntary employment, however, is not borne out by the evidence. For example, although 15 percent of employed scientists and engineers were working in non-S/E jobs in 1978, almost all selected this type of employment voluntarily because of better career opportunities, improved pay, or more interesting work.

labor market: dynamics and future conditions

The future S/E labor market balance depends critically on a number of factors: The number of new entrants to the S/E labor force; the nature and extent of mobility between S/E and non-S/E jobs; attrition from the S/E labor force; and, future trends in employment opportunities for scientists and engineers.

With respect to new S/E entrants, the number of bachelor's degrees has been levelling off since 1974; master's degrees have remained stable since 1972; and doctorates have slowly decreased since 1973. Demographic and economic factors indicate that these trends are likely to continue in the near future.

Mobility between S/E and non-S/E jobs can also alleviate S/E labor market imbalances. Of the almost 175,000 persons in technical and related occupations (but not science and engineering) in 1972, more than 62,000 (36 percent) had entered S/E jobs by 1976, the latest year for which data are available. About 25 percent of those were engineers. This return flow has been in response to the relatively strong employment opportunities for engineers. This mobility indicates that to some degree sudden surges in the S/E employment demand can be met from the available pool of scientists and engineers who are not employed in S/E jobs, if the incentives are sufficiently attractive. Offsetting this inflow, approximately 175,000 scientists and engineers working in S/E jobs moved either to managerial or other non-S/E jobs between 1972 and 1978. This type of mobility can alleviate some of the adverse consequences of unexpected declines in employment demand.

Attrition from the S/E labor force through death, retirement, or other reasons, provides job openings even when S/E employment does not grow. The annual attrition rate of less than 2 percent creates job openings for approximately 37,000 S/E professionals.

BEST DOCUMENT AVAILABLE

Uncertainty about future economic conditions makes attempts to estimate the S/E labor market balance for 1980 hazardous. Despite the declining rates of production of S/E degrees in recent years, however, the supply of scientists and engineers is expected to continue to outgrow the supply of S/E jobs, thus producing further increases in non-S/E employment. If recent trends continue, these increases in S/E supply will probably be concentrated in the sciences (except computer sciences) and not in engineering.

In addition to replacement needs, about 25,000 new jobs per year will be required to keep S/E unemployment and non-S/E employment from rising. Looking further into the future, between 1977 and 1987, NSF projects an annual growth rate of 4 percent in the full-time S/E doctoral labor force. As a consequence of this growth and projected demand, the proportion of doctoral scientists and engineers working in non-S/E jobs in 1987 is likely to rise to about 15 percent to 20 percent from 9 percent in 1977. These projections are based on likely extensions of current patterns. Alternative assessments based on major, generally unpredictable, deviations from these patterns could produce different results.

BEST DOCUMENT AVAILABLE

introduction

Parameters used to describe science and engineering (S/E) personnel are multi-dimensional and differ from science and technology funding data in several significant ways. Variables used to analyze and describe S/E personnel include those associated with labor markets—number employed, work activities, etc.—and those of a sociodemographic nature—sex, race, and educational levels. Data on scientists and engineers pertain to the stock of individuals involved in any aspect of science and technology as well as the flows of individuals into and out of science and engineering.

Because of the richness of S/E personnel data and the stock/flow character of the data, problems arise with respect to what data elements to report and the best way to organize these data to help illuminate the U.S. science and technology enterprise.

This document is organized around three topics. The first presents a concise overview of recent utilization (employment) patterns of scientists and engineers and assesses the adequacy of S/E employment in terms of balance between current demand and supply. To present a more complete overview, data also are given on sex and race of the overall S/E work force.

The second focuses on scientists and engineers who hold the doctorate and assess their current status in terms of employment and work activities. It also examines the projected supply/demand balance for these individuals in the eighties. Like the first chapter, some emphasis is given to the roles of women and minorities among the doctotal level S/E work force.

The final chapter deals with the dynamics of the S/E labor market by analyzing the occupational flows of the seventies. The flow components receiving primary attention are new entrants to the S/E labor force and occupational mobility.

Much of the data presented in the report were developed by the National Science Foundation's Division of Science Resources Studies as part of its on-going data collection and publications programs. Appendix A presents the concepts and definitions underlying the data as well as the major data sources.

The statistics presented in the report are subject to both sampling and nonsampling errors. The data sources listed in appendix A contain a complete description of the surveys used by NSF as well as their statistical limitations. In addition, projections shown in this report are based on assumptions of future economic and behavioral conditions. Changes in these assumptions would result, of course, in different projections.

BEST DOCUMENT AVAILABLE

chapter I

current utilization & supply patterns of scientists & engineers

Science and technology play an important and pervasive role in almost every aspect of modern life. Given this importance, there is a considerable interest in the quantity and quality of inputs available for these activities. One important input is the Nation's S/E human resources.

This chapter reviews recent utilization (employment) patterns of scientists and engineers and assesses the adequacy of S/E employment in terms of the balance between current supply and demand. The review begins with a discussion of scientists and engineers working in S/E jobs. This is followed by an examination of the utilization patterns—both of those working in S/E and in non-S/E jobs—by field, sector of the economy, and type of work activity. The chapter concludes with an assessment of current labor market conditions for scientists and engineers.

highlights

• The market for scientists and engineers, i.e., job opportunities in technical and nontechnical jobs, improved between 1976 and 1978, as shown by such measures as unemployment rates, job offers to new graduates, and other indicators of labor market conditions. By early 1979, nearly all scientists and engineers were in the labor force and had jobs, although roughly 15 percent voluntarily held non-S/E jobs. There were shortages in engineering and the computer sciences, but the total supply was generally greater than total demand for the natural and social sciences. Supply and demand may differ, however, for various science and engineering (S/E) subfields.

• Employment in S/E jobs remained relatively constant at 2.1 million between 1976 and 1978. Over this period, engineering jobs increased by 7 percent to 1.2 million, while science jobs declined by 8 percent to 890,000.

• Within the sciences, employment of computer specialists increased 30 percent, whereas employment in all other major science occupations declined.

• Between 1976 and 1978, S/E employment in all (technical and nontechnical) jobs increased at a slower rate than total U.S. employment (4 percent versus 8 percent). At the same time, the number of scientists and engineers employed primarily in research and development increased at a faster rate (9 percent) because of increased constant-dollar Federal R&D funding and an increase in economic activity.

• Business/industry was the largest employer of both scientists (45 percent) and engineers (78 percent). S/E employment in industry increased by 6.6 percent, slightly faster than the 4-percent rate that occurred between 1974 and 1976. The faster growth between 1976 and 1978 resulted partly from improvements in economic activity and a reversal of declining levels of industrial research and development in the early and midseventies.

• Between 1976 and 1978 S/E employment grew in educational institutions by 2.7 percent, a rate substantially slower than the 12.0-percent growth between 1974 and 1976. The relatively slower growth was concentrated among 2-year institutions.

• Part-time employment of scientists and engineers in universities and colleges grew at about three times the rate of full-time employment between 1974 and 1978. This continuing long-term trend resulted from both economic and demographic factors that have forced educational institutions to adjust to the limited numbers of full-time tenured positions available. In addition to the relative increase in employment of part-timers, a large portion of the growth in academic employment has been in nontenure jobs held by postdoctoral appointees and doctoral-level research staff.

• The number of employed S/E women has been increasing at a faster rate than that of men. Between 1976 and 1978, their number increased by 17 percent, while that of men increased by only 3 percent. During this period, the proportion of employed S/E women increased from 8.3 percent to 9.4 percent. Women, however, were underrepresented in science and engineering in comparison to their representation among all professional and technical workers (almost 43 percent in 1978).

• In 1978 about 4.4 percent of all scientists and engineers were racial minorities and almost one-half of these were of Asian extraction. Blacks, representing slightly more than one-third of all S/E minorities and 2 percent of all scientists and engineers, are substantially underrepresented in science and engineering in comparison to their representation among all professional and technical workers (about 7 percent to 8 percent).

• White, black, and Asian scientists and engineers had similar unemployment rates in 1978 (about 1.5 percent), in contrast to earlier years when the unemployment rate for blacks was considerably higher than the rates for their white and Asian counterparts.

BEST DOCUMENT AVAILABLE

s/e employment

The total number of employed scientists and engineers includes both those working in S/E jobs and those with S/E training working in non-S/E jobs. The number employed in S/E jobs represents a measure of the utilization of S/E-trained personnel in the Nation's scientific and technological activities.

Employment in S/E jobs, remained relatively constant at 2.1 million between 1976 and 1978. Over this period, engineering jobs increased by about 7 percent to 1.2 million, while science occupations declined by 8 percent to 890,000. With the exception of computer scientists, whose number grew by over 30 percent, employment in S/E jobs fell for all major fields of science.

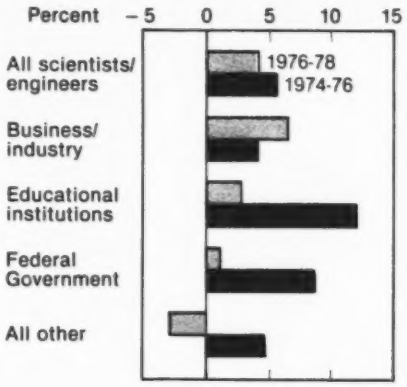
In contrast to the stable employment levels of S/E jobs between 1976 and 1978, employment of all scientists and engineers—both in S/E activities and outside of S/E activities—increased by about 4 percent—a rate slower than the 7.9-percent increase in total U.S. employment. Employment of scientists increased much more rapidly than that of engineers (6.0 percent vs. 2.2 percent). Growth of engineering employment, inhibited because of supply constraints, would have increased at a faster rate if additional engineers had been available. Although none of the increase in the employment of scientists took place in science activities, the data indicate that those with training in science found jobs. Also, there is evidence that the bulk of those working in non-S/E jobs do so on a voluntary basis.

shifts in sectoral employment patterns

Most S/E employees are concentrated in business/industry and in institutions of higher education; for that reason their employment is particularly sensitive to both business conditions and demographic factors that influence college enrollment levels.

S/E employment in business/industry increased by 6.6 percent between 1976 and 1978, compared to a growth rate of 2.7 percent in educational institutions (chart 1). This shift in the sectoral distribution of S/E employment reflects the improvement in business conditions following the 1974-75 recession and the generally slower growth (or decline) in enrollments in some institutions of higher education.

Chart 1. Growth rates of employed scientists/engineers by type of employer: 1974-78



SOURCE: National Science Foundation; appendix table B-3

business/industry

Business/industry was the largest employer of both scientists (45 percent) and engineers (78 percent) in 1978. The 1976-78 S/E employment growth rate in industry (6.6 percent) was more rapid than the 1974-76 rate (4 percent).

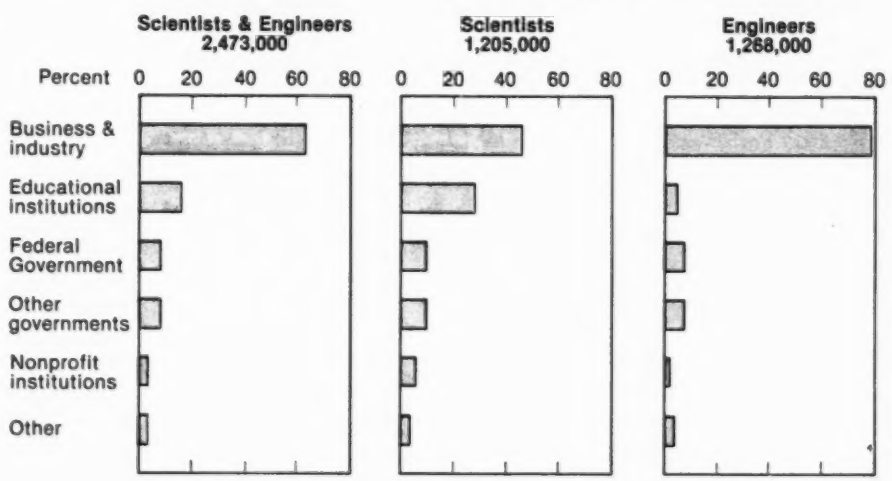
Real gross national product (GNP) grew less than 1 percent per year between 1972 and 1975. Measured in constant dollars, industrial R&D expenditures fell at an annual rate of about 1 percent between 1972 and 1975. Between 1975 and 1978, both GNP and industrial R&D performance grew at annual rates of almost 5 percent (in constant 1972 dollars) as the economy began its recovery from the 1974-75 recession.

educational institutions

In 1978, educational institutions employed about 4 percent of all engineers and about 28 percent of all scientists, making this sector the second largest employer of these personnel (chart 2). The 1976-78 S/E employment growth rate of these institutions (2.7 percent) was about one-third the rate shown between 1974 and 1976. Data from surveys of institutions of higher education show this slow growth concentrated among institutions that do not grant S/E degrees—primarily 2-year colleges.[1]

[1] National Science Foundation, "Academic Scientists and Engineers Increased 3% in 1978," *Science Resources Studies Highlights* (NSF 79-315) (Washington, D.C., July 31, 1979.)

Chart 2. Employed scientists/engineers by type of employer: 1978



SOURCE: National Science Foundation; appendix table B-4

BEST DOCUMENT AVAILABLE

Between 1976 and 1978, psychologists and computer scientists experienced the largest relative growth in academic employment (more than 25 percent each). These trends reflect, in part, changing course load requirements resulting from changing student majors. For example, the number of bachelor's degrees granted in the computer sciences increased more than 25 percent in this 2-year period.

Since 1972 part-time employment of scientists and engineers in universities and colleges has been growing at more than twice the rate of full-time employment (34 percent compared with 13 percent by 1978). More recent data (for the period 1976-78) show no indication that these relative trends have changed: part-time employment grew by 12 percent and full-time employment by 5 percent.

A study funded by NSF[2] found that the increase in employment of part-time personnel was a result primarily of economic and demographic factors. Declining rates of growth in enrollments, beginning in the late sixties, forced educational institutions to adjust to declines in the number of full-time tenure positions. Part-time faculty represent a more flexible personnel resource than full-time faculty since they are often less costly.

The recent growth in academic employment has resulted mainly from the increasing use of part-timers and the hiring of postdoctoral appointees and doctoral staff in nontenured jobs.[3]

federal government

In 1978, nearly 1 of every 10 scientists and engineers was employed by the Federal Government, the third largest employer of these personnel. S/E employment in this sector was unchanged from the 1976 level. Engineers, with 44 percent of the total, constituted the largest broad group of scientists and engineers employed by the Federal Government.

[1]David A. Katz and Howard P. Tuckman, "Part-timers in the Seventies—A Trend in Academia," unpublished, 1978.

[2]See, for example, National Science Foundation, *Characteristics of Doctoral Scientists and Engineers in the United States: 1977* (Detailed Statistical Tables) (NSF 79-306) (Washington, D.C., 1979.)

work activities

The work activities of scientists and engineers, as measured by the number, proportion, and distribution of those doing research and development, teaching, and other activities indicate the nature of the science and technology enterprise.

Research and development was the primary work activity of 28 percent of the Nation's scientists and engineers in 1978 (chart 3); this proportion was up slightly from that of 1976. An additional 9 percent of all employed scientists and engineers were in R&D management and administration (appendix table B-5). Thus, almost two-fifths (37 percent) were involved in some R&D activity.

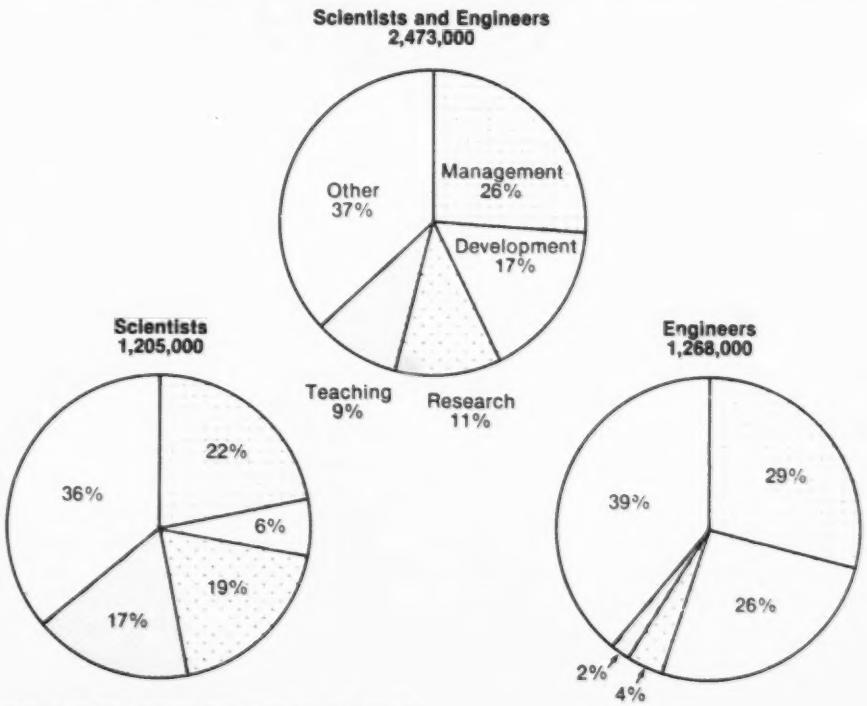
Between 1976 and 1978 the number of scientists and engineers primarily employed in research and development grew 9 percent, compared with 6 percent between 1974 and 1976. This accelerated growth in R&D involvement was concentrated in the industry sector (up 10 percent). Several factors affected this "surge," including increases in Federal funding of industrial research and development related to energy, the space shuttle program, and increases in economic activity.

About 9 percent of the scientists and engineers reported teaching as their primary work activity in 1978. These levels of teaching activity represent absolute declines (about 12,000) from 1976 levels.[4] In contrast, between 1974 and 1976, the number primarily engaged in teaching had risen by about 13,000.

Scientists continue to be more heavily involved in teaching than were engineers; 17 percent of the scientists (compared to 2 percent of the engineers) reported teaching as their primary work activity. In part, this contrast is a result of difference in education levels. A larger proportion of scientists hold doctorates (20 percent versus 4 percent), and thus are more likely to hold academic positions.

[4]The number of scientists and engineers primarily engaged in teaching activities fell 12,000, or 5 percent, between 1976 and 1978.

Chart 3. Employed scientists/engineers by primary work activity: 1978



SOURCE: National Science Foundation; appendix table B-6

BEST DOCUMENT AVAILABLE

Management/administration (including R&D management) was the primary work activity of 25 percent of the scientists and engineers. More engineers than scientists (29 percent versus 21 percent) reported management as their primary work activity. Of those in management, about 37 percent were primarily involved in the management of R&D activities.

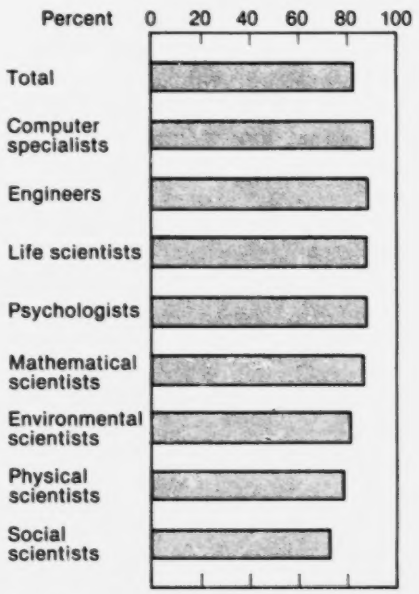
women

Like all women in the Nation's work force, the number of employed S/E women has been increasing at a faster rate than that of men. Between 1976 and 1978, employment of women scientists and engineers increased 17.4 percent compared to 2.8 percent for men, increasing their share of S/E employment from 8.3 percent to 9.4 percent in 1978. Employment of women in S/E jobs, however, like employment of men, remained unchanged between 1976 and 1978.

Despite their relative employment success, women scientists and engineers continued to experience higher unemployment rates than men (2.4 percent versus 1.3 percent) (appendix tables B-1 and B-2.) However, unemployment rates for these women were lower than the rates for all women in professional and technical fields (4.6 percent). Most of the observed sex differences in S/E unemployment rates can be attributed to differences in sex composition in the fields of mathematics, social sciences, and engineering. Coupled with their relatively high labor force participation rate (91 percent compared with 65 percent for women who had completed at least 16 years of schooling), the low relative rates of unemployment of S/E women indicate that the skills they have acquired are available and are utilized in the labor market. Women, however, are more likely than men to be in non-S/E jobs. In 1978, 75 percent of the employed S/E women were working in S/E jobs; for men the comparable figure was 85 percent.

Experienced S/E men earned significantly higher median annual salaries in 1978 than did women: $27,400 versus $22,600. Salary differentials reflect many factors such as field of employment, years of experience, and type of employer. Median salaries for S/E women averaged 82 percent of that for men, with the male/female differential ranging from a low of 73 percent for social sciences to 90 percent for computer specialists (chart 4). When comparing male/female salary differentials, it should be noted that S/E women had narrower differentials than did women college graduates in general. Salaries for S/E women averaged 82 percent of the salaries of their male counterparts in 1978. During the same year, median salaries for the total population of women college graduates was only 61 percent of that of men.[3] Moreover, S/E salary differentials appear to be narrowing. Between 1974 and 1978, of the experienced scientists and engineers—those in the labor force at the time of the 1970 Census of Population—median salaries for women increased by 44 percent, while salaries for men increased by only 40 percent. The salary differentials also are narrower for younger women. For example, among S/E doctorates, women under 30 years of age earned salaries that were about 7 percent below those for men of the same age, whereas for all ages the difference was approximately 20 percent.

Chart 4. Median salary differentials for science/engineering women by field: 1978
(Men = 100%)



SOURCE: National Science Foundation; appendix table B-10

minorities

The 112,300 minority group members in the S/E labor force in 1978 represented 4.4 percent of the total. Of these, 45 percent were persons of Asian extraction and 35 percent were blacks. Thus, blacks, at about 1.5 percent of the S/E labor force, were substantially underrepresented compared to their participation (6 percent) in the professional, technical, and kindred work force.[4] S/E unemployment rates for all races had declined substantially from 1976 levels, but the dramatic decline in the black S/E unemployment rate in effect brought the blacks' rate into parity with those of white and Asian scientists and engineers. Among scientists and engineers, blacks, whites, and Asians each experienced about the same unemployment rate—1.5 percent, compared to 5.3 percent for all blacks with four or more years of college.[5]

potential supply

The S/E population consists of the number of individuals who, because of their education, training, and work experience, represent the potential supply of those capable of carrying out the national science and technology effort. It can include those working as scientists and engineers, those with S/E training but working in non-S/E occupations, scientists and engineers who

[3] Department of Labor, Bureau of Labor Statistics, *Work Experience and Earnings in 1975 by State and Area*, Report 536 (Washington, D.C.: U.S. Government Printing Office), p. 20. Data for all college graduates are for 1975 and are probably biased upward as representative of male/female differences in earnings compared to 1978.

[4] Data for U.S. labor force participation rates from Department of Labor, Bureau of Labor Statistics, *Educational Attainment of Workers* (Washington, D.C.: U.S. Government Printing Office), p. A-11.

[5] Department of Labor, Bureau of Labor Statistics, *Employment and Unemployment During 1978: An Analysis*, Special Labor Force Report 218 (Washington, D.C.: U.S. Government Printing Office), p. 10.

BEST DOCUMENT AVAILABLE

are unemployed and seeking work, and scientists and engineers not in the labor force. The S/E population grew by only 1.3 percent between 1976 and 1978, a rate substantially down from the 9-percent growth rate over the 1974-76 period. The slower 1976-78 growth rate results partially from declines in the number of new graduates entering the S/E population. Since the early and midseventies, S/E degree production has been falling at the bachelor's and doctoral level, but has remained virtually stable at the master's level. The total S/E population of 2.7 million in 1978 comprises roughly equal numbers of scientists and engineers.

Between 1976 and 1978, the population of engineers increased at a slightly faster rate than did that of scientists (1.5 percent versus about 1 percent). The rough parity in growth rates, representing a change from earlier trends when numbers of engineers grew less rapidly than scientists, could reflect the recent relative strengthening of employment opportunities for engineers.[8]

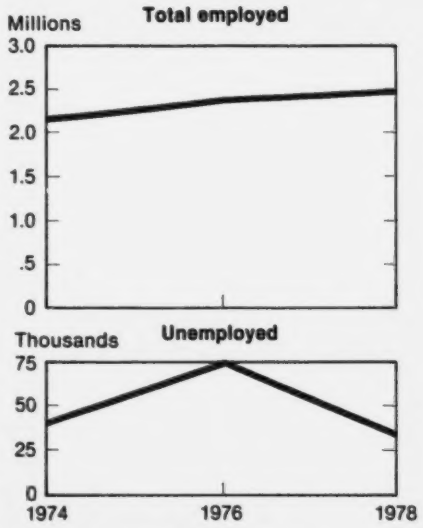
The slow relative growth in the total science population between 1976 and 1978 masks actual declines in the populations for some sciences: Physical sciences down 9 percent; mathematical sciences down 2 percent; environmental sciences down almost 6 percent; and substantial growth in others—computer sciences up 32 percent. These differences in recent population growth rates result partially from differences in relative market conditions—particularly in computer sciences, where employment demand has been strong. For example, a recent study of occupational mobility patterns indicates that 7 percent of those employed as mathematicians in 1972 had switched occupations and were employed as computer specialists in 1978.

the s/e labor force

The S/E labor force comprises scientists and engineers who are employed, either in or out of science and engineering, and those who are unemployed and seeking employment (chart 5). It is a measure of those who are economically active and thus available to carry out national S/E efforts.

Scientists and engineers continued to display a strong attachment to the labor force in 1978, with about 2.5 million, or 91 percent of the S/E population, participating. This participation rate is considerably higher than the rate of 71 percent for the general population completing four or more years of college. This difference in participation rates cannot be accounted for by differences in the sex composition of these groups. When further stratified by sex, S/E men have slightly higher rates than S/E women (92 percent vs. 89 percent) and S/E women have considerably higher rates than the rate in the total civilian labor force (89 percent versus 63 percent).

Chart 5. Employment status of scientists/engineers



SOURCE: National Science Foundation; appendix table B-11

labor market indicators

Assessment of the labor market for scientists and engineers requires determining whether the current supply is sufficient to meet the demands of the economy. Market conditions discussed below reveal a consistent pattern of shortages of engineers and computer specialists, and ample supplies of social, mathematical, and life scientists.

A standard measure of labor market conditions is the unemployment rate. Unemployment rates alone, however, are not necessarily a good indicator of market conditions for scientists and engineers for several reasons. The S/E labor market—in both science and engineering jobs and all other jobs—may be quite different than the overall U.S. labor market. Because of their high levels of skill, training, and education, the S/E unemployment rates generally are lower than those for all persons. Perhaps more importantly, unemployment rates do not indicate how successful are those with S/E training in finding jobs, either in or out of science and technology.

To help determine the relative market conditions for scientists and engineers in S/E work, a new measure—the S/E utilization rate—has been developed to show the degree to which scientists and engineers in the labor force hold S/E jobs.

In 1978 the S/E utilization rate was 83.4 percent, down slightly from the 1976 rate (85.3 percent). Within science and engineering, however, there were wide variances in the S/E utilization rate. Among major fields, the rate was highest for computer specialists (98.7 percent) and engineers (93.5 percent). Between 1976 and 1978, the S/E utilization rate increased for computer specialists, engineers, environmental scientists (primarily earth scientists), and physical scientists. The ratio declined for all major fields.

The overall decline in the S/E utilization rate was accompanied by declines in the unemployment rate (from 3.0 percent in 1976 to 1.4 percent in 1978). The relatively small growth in the S/E labor force, coupled with a more rapid increase in employer demand and the general improvement in economic conditions over the period, were responsible for the declines in unemployment. About 40 percent of the decline was accounted for by a reduction in the number of unemployed social scientists and psychologists. The data indicate, however, that most found jobs outside of science. During the 1976-78 period, unemployment rates for the total U.S. labor force

[8] Between 1974 and 1976, for example, the engineering population grew at only one-half the rate of the science population (6 percent versus 12 percent).

BEST DOCUMENT AVAILABLE

and for all professional and technical personnel also declined, but at relatively slower rates (chart 6). As with the S/E utilization rate, unemployment rates varied by field.

No single statistic can provide a basis for measuring particular surpluses and shortages of scientists and engineers, but some statistics, when examined together, permit inferences about the condition of the S/E labor market. For example, the U.S. Department of Labor designates certain jobs as "Hard-to-fill occupations at Job Service Offices."[9] Among those listed in late 1978 and early 1979 were electrical engineering, industrial engineering, mechanical engineering, civil engineering, and psychology. These five occupations, which offer only 1 percent of jobs available to the total U.S. labor force, represented nearly one-fourth of all designated "hard-to-fill" job vacancies listed with the public employment service.[10]

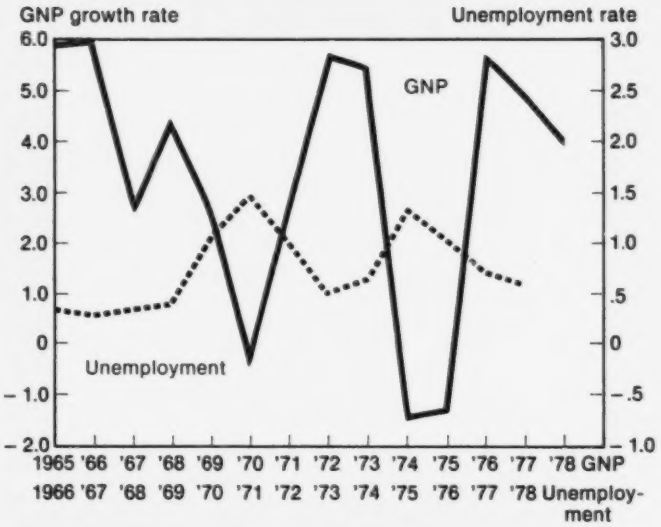
Another indicator of a possible shortage of particular S/E personnel is the March 1979 College Placement Council's report of college recruiting activity at the bachelor's-degree level. This report showed that engineering bachelor's received 40 percent more offers (not necessarily acceptances) between September 1978 and February 1979 than for the same period a year earlier. The most sought-after specialties, in order of demand, were mechanical, (including computer engineering), chemical, and civil engineering. The 17-percent increase in offers to the science graduates reflected primarily a 36-percent increase in offers to computer science majors. The humanities and social science groups had 9 percent fewer offers.[11]

The employment status of recent S/E graduates is another indicator of labor market conditions. In 1978, 38 percent of persons who received S/E bachelor's degrees one to two years earlier worked as scientists and engineers (about the same proportion as 1974 graduates in 1976), while 46 percent held non-S/E jobs with a wide variation among fields of science and engineering. Persons with degrees in the natural sciences and engineering show a significantly greater propensity to obtain jobs in S/E fields than those with degrees in the social sciences (chapter 3).

From the foregoing information, it can be inferred that, in early 1979, shortages existed in engineering and compute sciences; in other fields there were no apparent shortages. Information obtained from S/E professional societies and major industrial employers indicated a continuation of shortages for engineers and computer scientists in mid-1979.

A possible slowdown in economic activity in 1980 may cause demand for S/E personnel, to slacken. As shown in chart 7, the engineer unemployment rate, lagged by one year, has closely paralleled shifts in economic activity. The picture is not as clear for scientists. The number of natural sciences degree-holders has risen steadily since 1973; this may account for the apparent lack of shortages in those fields (with the exceptions of computer scientists). The declining unemployment rates between 1976 and 1978 for the broad natural science fields, coupled with the lack of indicators of shortages in science and engineering, suggest that the

Chart 7. GNP real growth and engineer unemployment rate
(lagged one year)

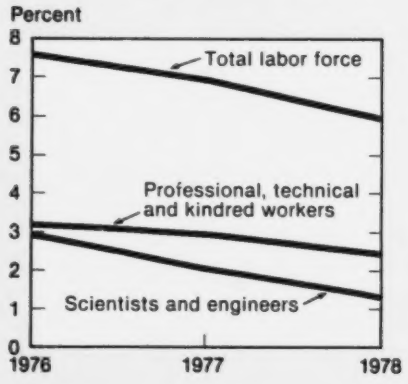


SOURCES: Economic Report of the President, 1979 and Department of Labor, unpublished; appendix table B-12

[9] State Employment Service Offices provide placement services through a national network with 2,500 locations.

[10] In assessing this information, note the following: (1) The Employment Services Offices listings do not represent total recruitment activities of employers. (2) Smaller scientific fields may be in short supply but do not generate the necessary listings to meet the job bank's cutoff point for inclusion in the "hard-fo-fill" category (1,000 job openings available at the end of each month). (3) There may be shortages of particular locations or for uniquely trained individuals which would not be reflected in the job bank data.

Chart 6. Unemployment rates



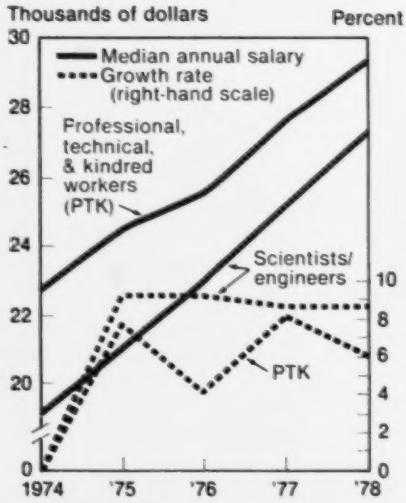
SOURCE: Department of Labor; appendix table B-11

[11] College Placement Council, Inc., *CPC Salary Survey: A Study of 1978-79 Beginning Offers*, Report No. 2 (Bethlehem, Pa., March 1979).

BEST DOCUMENT AVAILABLE

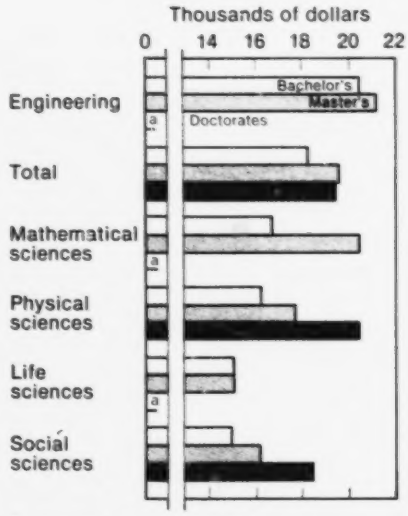
overall job market for natural scientists may have been either in rough balance or in surplus in early 1979. The S/E participation rate for social scientists was about 50 percent in 1978, down from about 77 percent in 1976. The number of new graduates in the social sciences has dropped steadily from 1974 to an estimated 85 percent of the 1974 level. The lack of reported shortages, the declining levels of new graduates, and the decline in the S/E participation rate from 1976 to 1978, all combine to suggest that the labor market for social scientists was probably in surplus in early 1979. Moreover, because a large number of social scientists are employed in private industry, this situation may further deteriorate as a result of the slowdown in the economy's growth that started in 1978. An exception to these inferences seems to be the field of economics, where indicators outlined above point to a balanced market.

Chart 8. Salaries and annual growth rates for professional, technical, and kindred workers and scientists/engineers



SOURCES: National Science Foundation; Department of Labor; appendix table B-7

Chart 9. Salaries by field and degree level: 1972 science/engineering bachelor's recipients in 1978



[a]Too few cases to report medians.

SOURCE: National Science Foundation; appendix table B-8

s/e salaries

Relative salaries, generally a good indicator of market conditions, rise when relative demand is strong and fall when relative demand is weak (chart 8).

The median annual salary of experienced[1] scientists and engineers rose from $23,000 to $27,200 between 1976 and 1978, for an average annual growth of 8.7 percent. Adjusting for inflation, the annual rate of growth was less than 2 percent per year. The current-dollar growth rate was slightly higher than the 7.8 percent per year experienced by production workers in nonagricultural establishments, persons with four or more years of college, and persons in professional, technical, and kindred occupations.

The median annual salary of recent graduates from S/E programs rose from $13,000 to $16,000 during the same period, an average annual growth rate of 12 percent per year. Adjusting salaries of new S/E graduates for inflation suggests that the relative demand for these scientists and engineers (compared with experienced ones and with new graduates in other fields) may be increasing.

Salaries also differed by degree level. These differences can provide important information for career choice and education decisions. For experienced scientists and engineers, those with doctorates earned 10 percent more on average than those with master's degrees; and those with master's degrees earned on average 3 percent more than those with bachelor's degrees. Recent labor market conditions, however, may be discouraging potential S/E enrollees in some graduate program. A sample of persons who earned bachelor's S/E degrees in 1972 was surveyed in 1978 to ascertain their education and labor market experiences, including salaries (chart 9). Although, on average, the acquisition of a master's degree in S/E fields seems to enhance earnings potential by more than 7 percent, the corresponding gain in engineering (3.4 percent) and life sciences (none) could act to discourage graduate enrollments in these latter fields.

[1] "Experienced" scientists and engineers are those who were in the experienced civilian labor force at the time of the 1970 decennial Census in one of 65 engineering, scientific, or related occupations. "Recent" graduates are those who entered the S/E population by graduating with S/E degrees from universities and colleges since 1970.

BEST DOCUMENT AVAILABLE

chapter II

doctoral scientists and engineers

S/E doctorate-holders, a particularly critical component of the human resources devoted to science and technology, frequently assume major roles in these activities. Over one-half are employed in educational institutions, where they are involved in the training of future scientists and engineers and in the performance of basic research activities to expand scientific and technical knowledge. Regardless of sector of employment, almost one-half are primarily engaged in R&D activities that can result in the innovations that improve national productivity.

Because of their unique importance, this section of the report devotes special attention to scientists and engineers with doctorates. In particular, the following characteristics are examined: employment status, the nature of work activities, and demographic characteristics (e.g., age, sex, race). In addition, this chapter includes projections of supply and utilization for the latter part of the eighties.

highlights

- Slightly over 300,000 scientists and engineers with doctorates were employed in 1978. Since 1973, employment of these Ph.D.'s has increased at an average annual rate of 6.5 percent (37 percent over the 5-year period), which is substantially above the 3-percent employment growth rate for all scientists and engineers.

- By field, those doctorates showing above-average employment growth rates were computer specialists (136 percent), social scientists (63 percent), and psychologists (46 percent). Physical scientists (25 percent), mathematical scientists (25 percent), and life scientists (30 percent) had below-average growth rates.

- Although educational institutions continue to be the principal employers of S/E Ph.D.'s (57 percent), the relative importance of these institutions as employers declined slightly (2-percentage points) between 1973 and 1978. This decline reflects the tapering off of enrollment growth at both the undergraduate and the graduate levels.

- The proportion of the S/E doctoral work force primarily engaged in research and development remained stable at about 44 percent between 1973 and 1978. This relative stability masks offsetting shifts that have been occurring within sectors. R&D activities have increased relatively in academia, primarily because of increases in the number of postdoctorates and in the size of the doctoral research staff; there was a relative decline in business/industry (from 71 percent to 66 percent).

- There has been a redistribution among types of R&D activity. The number of scientists and engineers primarily engaged in development has increased by almost 80 percent since 1973, while the number primarily engaged in research has increased by slightly more than 30 percent.

- The number of employed women S/E doctorates increased more than twice as fast as the number of men. Nevertheless, women still accounted for only about 10 percent of employed S/E doctorates in 1977.

- Racial minorities also registered gains during this period (employment up 63 percent), and accounted for about 7 percent of the employed S/E Ph.D.'s in 1977, up from 5 percent in 1973. All racial minority groups showed numerical increases, but the overall relative increase was almost entirely attributable to growth in the number of Ph.D.'s of Asian extraction. Blacks, who make up about 13 percent of the U.S. population, represent only 1 percent of the employed S/E Ph.D.'s.

- NSF projects an annual growth rate of 4 percent for the full-time doctoral S/E labor force between 1977 and 1987. The growth rate is about twice that projected for the total civilian labor force.

- In 1977 about 9 percent of the full-time doctoral labor force held non-S/E jobs (most voluntarily), or were unemployed. This proportion is projected to increase to 17 percent by 1987 as the number earning S/E Ph.D.'s exceeds the number of jobs requiring this level of education. All broad fields of science, with the exception of physical sciences, are expected to share in the rapid expansion of non-S/E utilization.

BEST DOCUMENT AVAILABLE

employment status

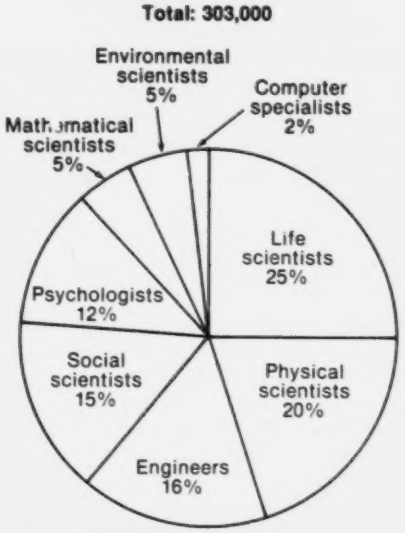
There were an estimated 303,000 employed S/E doctorates in 1978.[11] Over 90 percent were employed in S/E jobs. A slight downward trend in this percentage, however, has been occurring since 1973. Between 1973 and 1977 employment in S/E jobs increased 25 percent while employment in non-S/E jobs increased 89 percent. Almost all of those in non-S/E jobs were there voluntarily because of higher salaries, better promotional opportunities, or locational preferences. Since 1973, employment of Ph.D. scientists and engineers has increased at an average annual rate of 6.5 percent, an employment growth rate substantially above that for all scientists and engineers.

by field

Scientists with doctorates continue to outnumber engineers with doctorates by more than five to one in 1978 (chart 10). For all degree levels, the number of scientists is roughly equal to the number of engineers. Although employment of doctoral scientists increased at about the same rate as engineers (36 percent to 37 percent) during the 1973-78 period, there was substantial variation among the fields of science. The highest growth rates were registered by computer specialists and social scientists (chart 11). The employment increase of social scientists represented over 20 percent of the total estimated growth for all doctoral scientists and engineers. The basis for the rise was the substantial growth of social scientists employed in educational institutions.

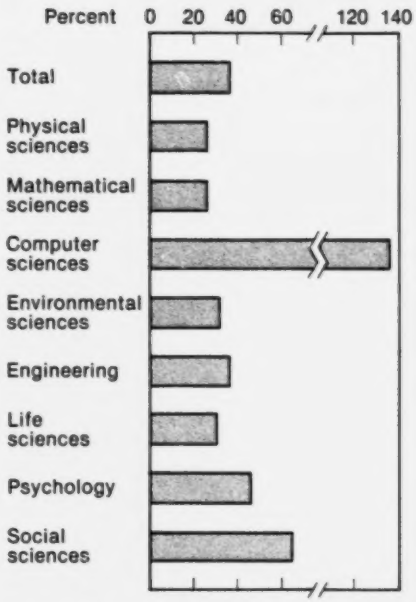
[11] Including full-time employed, part-time employed, and postdoctorates.

Chart 10. Employed doctoral scientists/engineers by field: 1978 (est.)



SOURCE: National Science Foundation; estimates based on appendix table B-19.

Chart 11. Estimated growth rates of employed doctoral scientists/engineers by field: 1973 and 1978.



SOURCE: National Science Foundation; estimates based on appendix table 11-19.

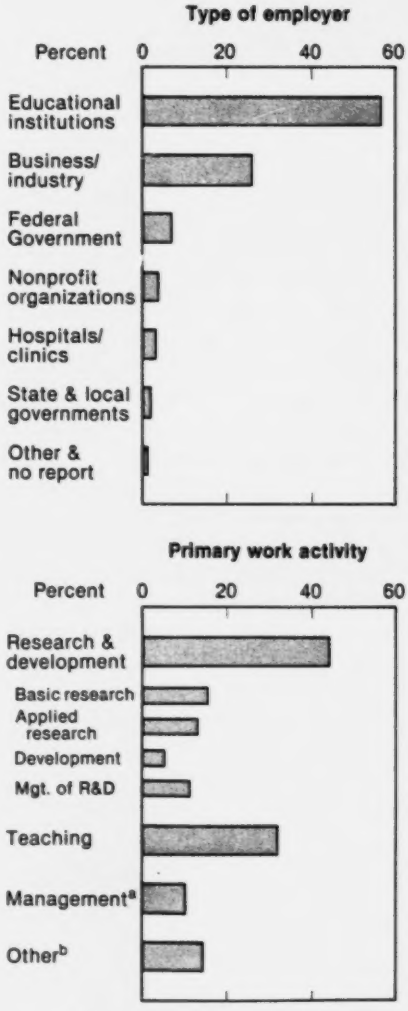
by sector

Between 1973 and 1978 the sectoral distribution of employed doctoral-level scientists and engineers shifted only slightly. Educational institutions continue as the principal employers of S/E Ph.D.'s (chart 12). The relative stability in the sectoral distribution, however, masked notable absolute changes. The number of S/E Ph.D.'s employed in educational institutions increased by an estimated 34 percent between 1973 and 1978, and in business and industry estimated employment was up 42 percent.

The relatively slower employment growth in educational institutions reflects the tapering off of enrollment growth that occurred over this period, at both the undergraduate and the graduate levels.[14] As noted in chapter 3, demographic trends indicate that this tapering off will continue through the mideighties. Thus, the share of S/E

[14] Department of Health and Human Services, National Center for Education Statistics, *Earned Degrees Conferred*, annual series.

Chart 12. Doctoral scientists/engineers: 1978



[a]Other than R&D
[b]Other activities and no report
SOURCE: National Science Foundation; estimates based on appendix tables B-19 and B-20

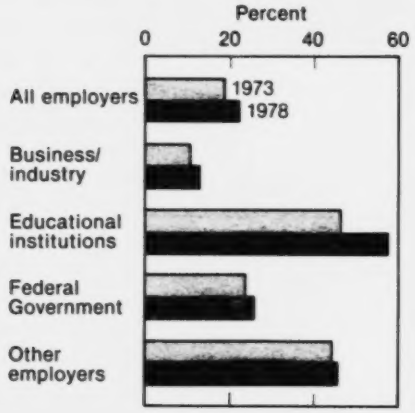
BEST DOCUMENT AVAILABLE

doctoral employment by educational institutions is apt to decline.

The slight 1973-78 relative shift from academic to nonacademic employment is reflected in data on the employment plans and experiences of young Ph.D.'s; the 1972-77 graduating cohorts indicate a declining proportion (40 percent to 35 percent) anticipating academic employment. Moreover, data on employment affiliations of S/E Ph.D.'s from the 1971-74 graduating cohorts show an increase from 16 percent to 21 percent in the proportion who obtained industrial employment. To some extent, the relative decline in expected academic employment was offset by the large increase (80 percent) in academic postdoctoral appointments that occurred during the 1973-78 period. About 10 percent of the increase in academic employment of doctoral-level scientists and engineers resulted from the increase in postdoctoral appointments (appendix table B-15). Similarly, the importance of nontenure track appointments—research and part-time appointments—rose during this period.[15]

[15] Department of Health, Education, and Welfare, National Center for Education Statistics, *Projections of Education Statistics to 1986-87* (Washington, D.C.: U.S. Government Printing Office, 1978), p. 66 and National Research Council, National Academy of Sciences, *Science, Engineering, and Humanities Doctorates in the United States, 1977 Profile* (Washington, D.C., 1978), pp. 20-22.

Chart 13. Proportion of doctoral scientists/engineers in the R&D work force by type of employer: 1973 and 1978



SOURCE: National Science Foundation; estimates based on appendix table B-21

The relative increase in industrial employment was evident in most S/E fields with computer specialists and psychologists registering disproportionately large increases. These fields, which represented about 8 percent of the industrial employment in 1973, accounted for 22 percent of the employment increase. Although the industrial employment of doctoral engineers and chemists increased at below-average rates, this sector continued to provide them with a major source of employment opportunities. About one-half of all employed Ph.D. chemists, engineers, and computer specialists had jobs in business and industry (appendix table B-20).

work activities[16]

In 1978 over two-fifths of all doctoral-level scientists and engineers were engaged in research and development (including management of research and development), which continues as their dominant, primary work activity. Teaching was reported as the primary activity of about another one-third (chart 12).

The work patterns of S/E doctorates (as measured by primary work activity) have been changing, but the changes have differed substantially among employment sectors. In educational institutions, teaching activities have declined relative to other activities, while R&D activities showed both relative and absolute increases. In other employment sectors, however, there has been a relative shift from R&D to non-R&D activity. These shifts have had offsetting effects and, as a result, the proportion of S/E doctorate-holders primarily engaged in R&D activities in all sectors remained stable at about 44 percent between 1973 and 1978.

Changes in work patterns among those primarily engaged in research and development also occurred during this period. Their number increased by about 78 percent, compared to a 34-percent increase in the number in research activities alone. As might be expected, more than 60 percent of the growth in development activities was in the business/industry sector, which conducts the bulk of these activities. The smallest increase (22 percent) took place in R&D management.

The 1973-78 stability in the proportion of doctorates in R&D activities assumes added significance in light of other R&D indicators. While the number of doctorates primarily engaged in some aspect of R&D work increased at an average annual rate of about 6 percent, R&D expenditures (in constant dollars) increased at a much slower rate (about 1 percent per year).[17] Also, the proportion of the doctoral R&D to total R&D work force rose slightly from 1973 to 1978 from 19 percent to 22 percent (chart 13.) This increase resulted either from the excess supply of scientists and engineers available to do R&D work, or from changes in the nature and complexity of R&D activity which now makes the Ph.D. scientist or engineer more attractive to employers.

labor market balance

The supply of S/E doctorates available for labor market activity is drawn from the stock of such individuals. Therefore, changes in this stock are a major determinant of changes in supply.

In 1978 there were an estimated 320,000 doctoral scientists and engineers in the United States (about 12 percent of the total S/E population). During the 5-year period, 1973-78, their number increased at an average annual rate of 6.0 percent, more than twice the rate of increase (2.5 percent) in the total number of scientists and engineers. Thus, S/E doctorates are becoming an increasingly larger share of the S/E population. This trend is expected to continue past 1980.

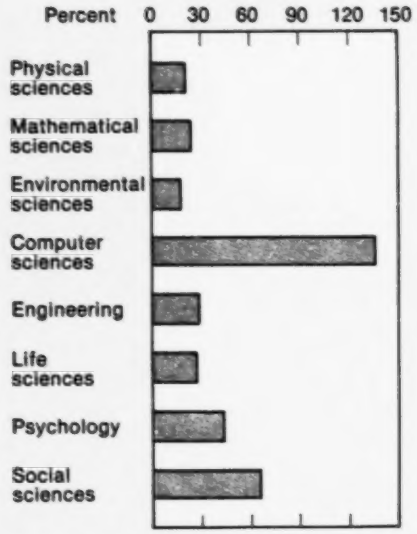
The 1973-78 growth rates were above average for computer specialists, social scientists, and psychologists, with growth rates in excess of 100 percent, 60 percent, and 40 percent, respectively (chart 14). Environmental, physical, and mathe-

[16] Primary work activity is defined as that activity to which the individual devotes the greatest amount of time.

[17] National Science Foundation, *National Patterns of R&D Resources: Funds & Personnel in the United States, 1953-1978—79* (NSF 78-313) (Washington, D.C.: U.S. Government Printing Office, 1979.) Note further that R&D expenditures (in constant dollars) actually declined from 1973 through 1975 and then increased during the next two years.

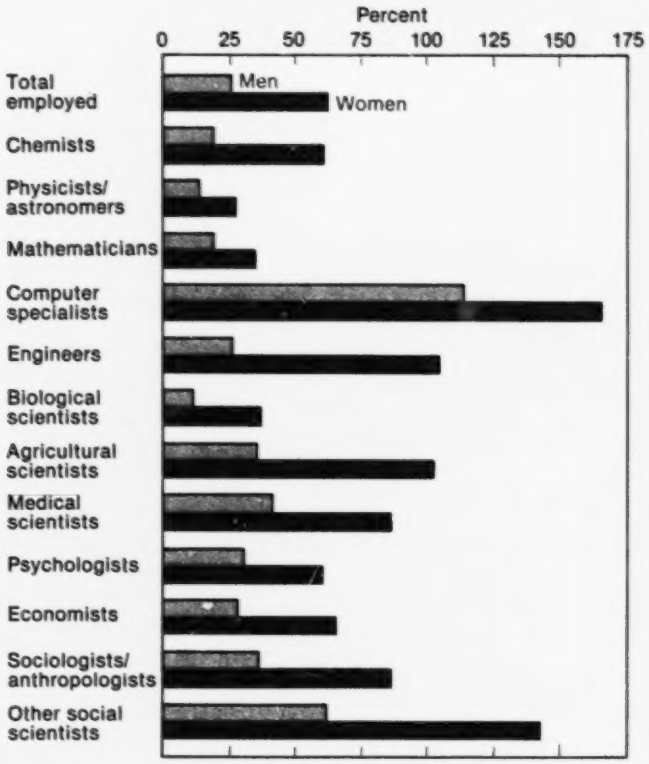
BEST DOCUMENT AVAILABLE

Chart 14. Growth rates of the doctoral scientist/engineer population by field: 1973-78 (est.)



SOURCE: National Science Foundation; estimates based on appendix table B-17

Chart 15. Growth rates of employed doctoral scientists/engineers by field and sex: 1973-77



SOURCE: National Science Foundation; appendix tables B-19 and B-23

matical scientists grew at rates of around 20 percent. Physical and life scientists accounted for nearly one-half (46 percent) of total S/E doctorates. Social scientists (including psychologists) accounted for another 28 percent. The labor force includes individuals who are employed as well as those seeking employment. The labor force participation rate (the ratio of the labor force to the total population) shows the fraction available for work. The estimated participation rate for S/E doctorate-holders exceeded 96 percent in 1978, a rate substantially above that for all college graduates (77 percent); the unemployment rate was only 1.1 percent, a lower rate than that for those nondoctoral scientists and engineers. These high rates of participation and low rates of unemployment indicate that a very large fraction of S/E doctorates (about 95 percent) is being utilized in the labor market, although not necessarily in S/E jobs. Roughly 85 percent with S/E doctorates were actively engaged in S/E jobs.

women

employment

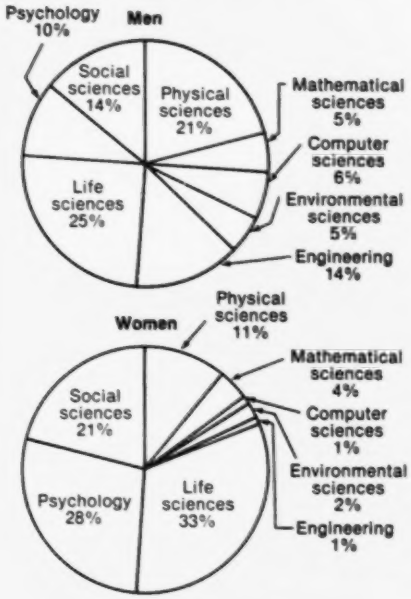
Employment of women scientists and engineers with doctorates has been increasing at twice the rate of men since 1973. Employment of men increased 26 percent from 1973 through 1977 while women registered a 62-percent gain; and women's share of total doctorate-level employment increased from 7.7 percent to 9.7 percent.

This increase in the female share also occurred in each individual S/E field (chart 15). Although growth rates exceeding 100 percent occurred in the employment of computer specialists and engineers, women continue to represent only a small fraction of doctorate-holders in these fields. Growth rates were also relatively large (over 100 percent) in the social science fields, which have traditionally included larger proportion of women (14 percent in 1977) than most other fields.

The field distribution of women doctorates remains quite different from that of males. Women tend to be concentrated in psychology, life sciences, and social sciences, while men tend to be concentrated in engineering and physical sciences (chart 16). Men and women S/E doctorates also differ in their primary work activities. Teaching continues as the dominant work activitiy of women. In 1977 about 38 percent of all such women reported this to be their primary work, a higher level than that for men (31 percent). A larger proportion of men were engaged in R&D activities in 1977 than women (45 percent vs. 32 percent).

BEST DOCUMENT AVAILABLE

Chart 16. Employed doctoral scientists/engineers by sex and field: 1977



SOURCE: National Science Foundation; appendix tables B-19 and B-23

supply/utilization

The 1977 population of approximately 300,000 S/E doctorates included about 32,000 women. About 90 percent were in the labor force in 1977, roughly the same rate as S/E males.

The unemployment rate for women S/E doctorates remains substantially above that for men, a pattern similar to the sex differentials in unemployment found for all scientists and engineers. In 1977, S/E men had an unemployment rate of 0.9 percent, while women had a rate of 3.4 percent. These rates have remained essentially unchanged since 1973.

Several factors may contribute to this higher unemployment rate for women. First, women tend to be concentrated in the social sciences, which typically exhibit higher unemployment rates than the natural sciences or engineering. Second, women, particularly those who are married, may have more stringent job requirements—such as strong locational preferences or hours of employment—and therefore may spend more time searching for the "right" job. Third, because of nonlabor market activities (including perceived family responsibilities) women may tend to enter and leave the labor force with more frequency than men, thereby experiencing a higher frictional unemployment rate. Finally, women—even those with doctorates—may be victims of discrimination in employment despite the vigorous affirmative-action programs initiated in recent years.

minorities

employment

The employment characteristics of S/E doctorates differed among racial groups. The differences between blacks and Asians are especially striking. Examination by field reveals that employed black S/E doctorates were highly concentrated in psychology and the social sciences. These fields accounted for about two-fifths (39 percent) of black employment, but for only 27 percent of the white S/E doctoral employment, and only 11 percent of the Asian. Whites and Asians were concentrated in other fields, especially environmental sciences and engineering. These two fields accounted for only about 5 percent of employed black S/E doctorate-holders, compared with 20 percent for the employed whites and about 5 percent for the Asians. The concentration of Asians in the engineering fields (31 percent) was particularly striking (chart 17).

The field dissimilarities among racial groups draws attention to other important differences in sectoral employment patterns. Because of their concentration in social sciences, employment of black S/E doctorates is academically oriented; about 66 percent were so employed in contrast with about 58 percent for the whites and 48 percent for the Asians. Only about 15 percent of employed black S/E doctorates worked in business and industry, a proportion substantially smaller than whites (25 percent), and especially smaller than the Asians (38 percent). Among other employment sectors, the distributions of racial groups were similar; however, blacks were more concentrated in Federal civilian employment (11 percent) than whites (8 percent) and Asians (5 percent).

Patterns of primary work activity also differed among racial groups, partly as a result of the field and sectoral differences discussed above. A larger share (about 35 percent) of employed black S/E doctorates reported teaching as their primary work activity; this proportion is somewhat higher than whites (32 percent) and substantially higher than Asians (23 percent). The dissimilarity between blacks and Asians in their propensities to be in teaching reflects, in large measure, the relative concentration of blacks in academia, and Asians in business and industry. Sharp differences in sectoral concentration were also evident in involvement in R&D activities; about 36 percent of the black S/E doctorate-holders were so engaged, compared with 63 percent among Asians.

supply/utilization

About 6.3 percent of all doctorates were members of racial minority groups in 1977 (compared with 5 percent in 1973). Collectively, minorities accounted for about 13 percent of the U.S. population. Persons of Asian extraction (who constitute about 80 percent of the racial minorities holding S/E doctorates) accounted for most of the growth. Other minority groups (e.g., Hispanics, blacks, and American Indians) generally maintained their shares of this population. In 1977, blacks represented about 8 percent of all professional and technical workers, but accounted for only about 1 percent of the S/E doctorates.

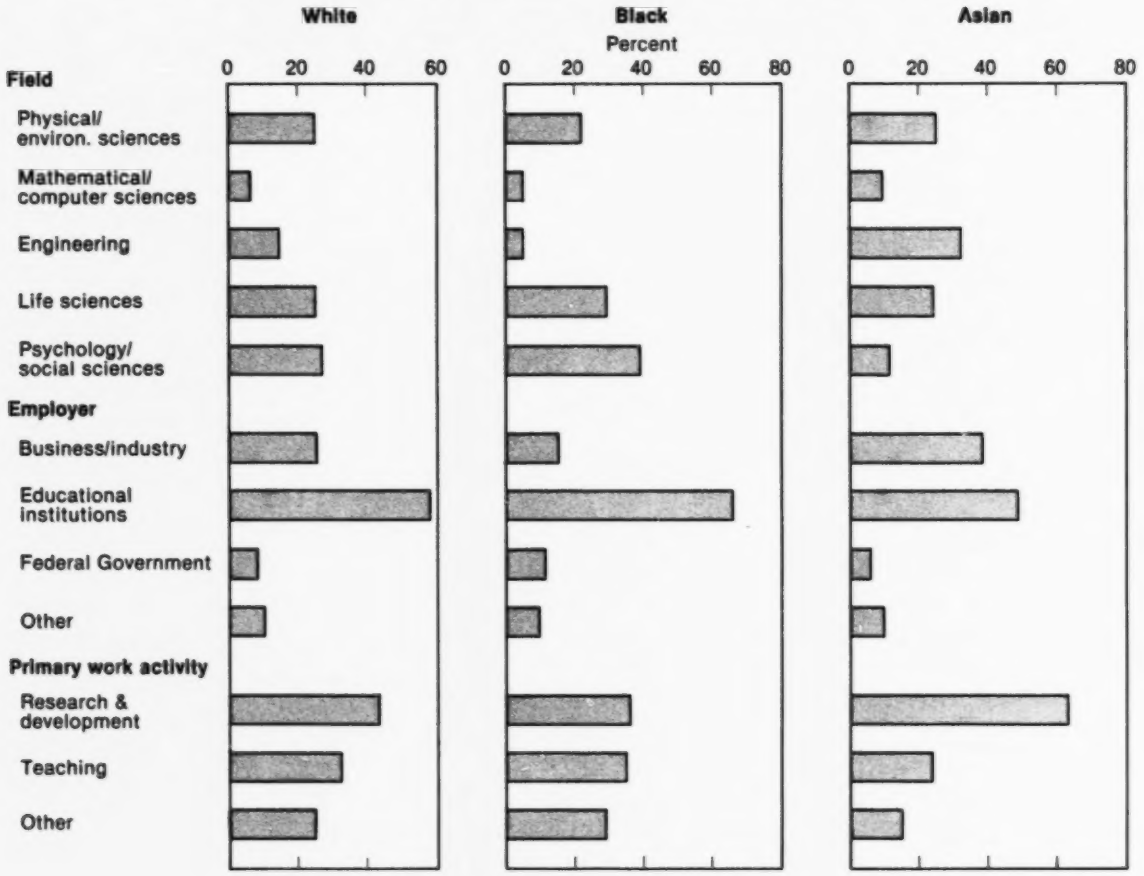
One of the reasons for this underrepresentation of blacks is their relatively higher early-school dropout rates. Recent data show that, among persons between the ages of 18 and 24, the high school dropout rate for blacks was about 24 percent (compared to about 15 percent for whites);[18] and at the college level, the "survival" rate[19] for black students

[18] Department of Commerce, Bureau of the Census, "School Enrollment-Social and Economic Characteristics of Students: October 1977," *Current Population Reports*, Series P-20, No. 333 (Washington, D.C.: U.S. Government Printing Office, 1979.)

[19] Survival rate is the percentage of students who were college juniors three years after graduation from high school.

BEST DOCUMENT AVAILABLE

Chart 17. Characteristics of employed doctoral scientists/engineers by race: 1977



SOURCE: National Science Foundation; appendix tables B-26 and B-27

was about 15 percent (compared to about 22 percent for white students).[20]

Almost all (98 percent) racial minorities with S/E doctorates were in the labor force in 1977. The labor force participation of racial minorities was slightly above that for whites (95 percent), with no significant difference among the various minority groups.

A comparison of the unemployment experience of minorities and nonminorities who hold S/E doctorates reveals relatively low rates and essential racial parity. In 1977 the unemployment rates of whites and all racial minorities[21] were 1.1 percent and 1.5 percent, respectively. Little change has occurred in these rates since 1973 (appendix table B-17).

projected supply and utilization

In the early seventies, there was concern that a significant number of individuals with new S/E doctorates would be unable to find S/E employment. This concern displaced concerns of the preceding decade that there would not be highly trained individuals to meet national goals.

supply

NSF and the Bureau of Labor Statistics (BLS) have projected a full-time doctorate S/E labor force ranging between 410,000 and 420,000 by the mideighties; such a total, about 50 percent higher than that of 1977, would represent an annual growth rate of about 4 percent. In contrast, projections of the total civilian labor force for the same period (1977-85) indicate an average annual growth rate between 1.9 percent and 2.3 percent, depending on assumptions.[22]

[20] Department of Health and Human Services, National Center for Education Statistics, *The Influence of High School Racial Composition on Black College Attendance and Test Performance* by Robert L. Crain and Rita E. Marhard, Special Report Series (78-212), The Rand Corporation, January 1978 (Washington, D.C.: U.S. Government Printing Office, 1979.)

[21] The unemployment rates of separate racial minority groups, especially blacks and American Indians, must be interpreted with caution, since these estimates are subject to substantial sampling variability. Thus only aggregate rates of unemployment for minorities are computed.

[22] These labor force projections were developed by the Department of Labor, Bureau of Labor Statistics, "New Labor Force Projections of 1990, Three Possible Paths," *Monthly Labor Review*, December 1978.

BEST DOCUMENT AVAILABLE

Thus, S/E doctorates are expected to be a larger share of our future work force. Substantial variation in growth is anticipated among the major S/E fields (chart 18). In general, the labor force for physical scientists and mathematicians is projected to increase relatively slowly—30 percent to 35 percent over the 1977-87 period.

Chart 19 outlines the gross flows into and out of the doctoral-level labor force for the NSF projections. The number projected to enter the full-time labor force (primarily new degree-holders) is estimated at 230,000 over the 1977-87 period, while an estimated 94,000 are projected to leave (chiefly because of deaths and retirement), for a net gain of 136,000.

utilization

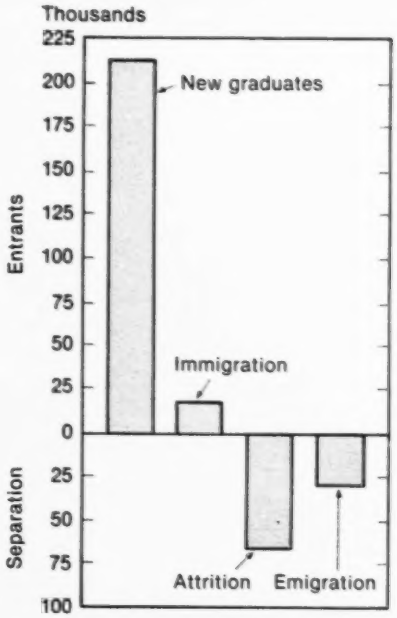
As noted in earlier sections, practically all doctoral-level scientists and engineers in the labor force have been able to find employment. In 1977 only about 5.2 percent were not in the labor force and only 1 percent were unemployed. However, a notable fraction of the Ph.D. scientists and engineers have held non-S/E jobs (about 9 percent in 1977, most on a voluntary basis). By the mideighties approximately 14 percent to 17 percent (60,000 to 80,000) of all S/E doctorate-holders in the full-time S/E labor force may be employed in non-S/E positions or may be unemployed (chart 20). About 340,000 to 350,000 S/E doctorates are projected to be employed full time in S/E-related positions by the mideighties, up by about two-fifths from the 245,000 in 1977.

With the exception of engineering, BLS and NSF projections generally agree on the balance between supply and utilization in each field. BLS foresees a small shortage of doctoral engineers, while NSF projects that about 15,000, or 19 percent, of this group will hold non-S/E positions. The variation in forecasts results primarily from differences in projections of new degree-holders: the NSF model projects more doctorates than BLS.

Accompanying the anticipated growth in utilization is a continued shift away from the traditional dominance of universities and colleges as the major employers of S/E doctorate-holders. NSF projects that academia may employ only 40 percent of all full-time Ph.D. scientists and engineers by 1987, compared with 57 percent in 1977. This projected sectoral shift will be brought about largely through changes in the employment patterns of new doctorates. About 130,000 new S/E doctorates are projected to acquire full-time S/E positions between 1977 and 1987. NSF projects that only one-third of these will be employed by academic institutions. In contrast, about 35 percent of the new degree-holders are forecast to be employed in industry by 1987.[24]

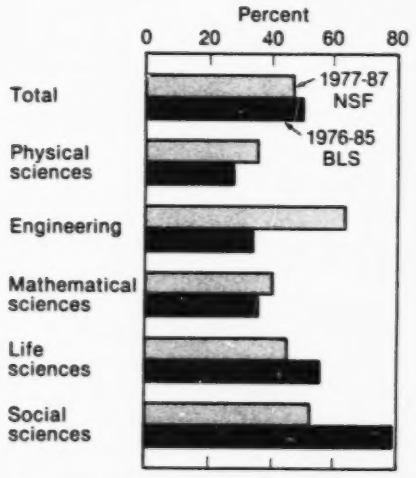
[24] These figures are not strictly comparable, because the 1977 proportions include those working in non-S/E positions.

Chart 19. Derivation of full-time labor force of doctoral scientists/engineers: 1987



SOURCE: National Science Foundation; appendix table B-29

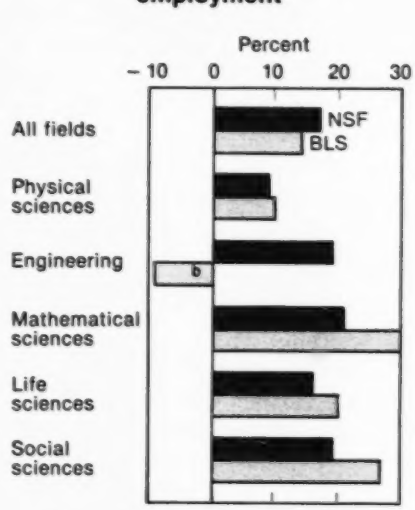
Chart 18. Projected changes in supply of doctoral scientists/engineers by field[a]: 1977-87 and 1976-85



[a]Changes for NSF are from 1977 and 1987 and are based on the full-time labor force. For BLS, the data reflect changes in total employment from 1976 and 1985.

SOURCES: National Science Foundation; Bureau of Labor Statistics; appendix table B-28

Chart 20. Projections of doctoral scientists/engineers in nonscience/engineering employment[a]



[a]For NSF, data show estimated non-S/E utilization as percent of labor force for 1987. For BLS, data pertain to estimates of Ph.D's in traditional jobs as percent of total Ph.D employment in 1985.

[b]That is, the supply of engineering Ph.D's is projected to fall short of requirements.

SOURCE: National Science Foundation; Bureau of Labor Statistics; appendix table B-30

BEST DOCUMENT AVAILABLE

chapter III

the dynamics of s/e labor market

The S/E labor market has undergone every phase of a traditional labor market cycle since the early fifties—from a rapid increase in demand coupled with a small supply of workers in the fifties and early sixties, to an abrupt decline in demand in the late sixties and early seventies. Demand for scientists and engineers began to grow slowly later in the seventies, and current data (1979) indicate a continuing but moderate growth in jobs.

The labor market for scientists and engineers operates as other markets do through the interactions of supply and demand. Exogenous shocks—such as business cycles, technological changes, international events, or changes in public programs and policies—can alter the equilibrium of these markets, thereby creating supply/demand imbalances. Movements back toward equilibrium occur with appropriate changes in supply or demand. These changes are observed in the flows of scientists and engineers among jobs, regions, and industries; between work and nonwork activities; and among work activities and occupations.

highlights

- Between 1974 and 1978 the number of bachelor's degrees granted in science and engineering declined 6 percent, and the number of S/E doctoral degrees granted declined by 7 percent. In contrast, the number of master's S/E degrees increased by 4 percent.

- Not all S/E-degree recipients actually enter the S/E work force. In 1978 only 38 percent of those who earned bachelor's degrees one or two years earlier were employed in S/E jobs. A significant proportion (about 20 percent), however, were attending graduate school on a full-time basis.

- Only 28 percent of bachelor's-degree recipients worked in the occupation of their major two years after graduation, while approximately four-fifths of those earning doctorates were working in such occupations. The number of recent S/E graduates at all degree levels working in S/E jobs represented about 4 percent of the S/E labor force in 1978. Individuals receiving degrees in engineering, computer sciences, and chemistry show the greatest affinity between field of degree and field of employment; those receiving degrees in psychology, social sciences, and mathematics show the least affinity.

- Both continuation- and completion-rate behavior are reflected in the ratio of the number of S/E doctorates awarded to the number of S/E bachelor's degrees awarded seven years earlier. This ratio declined from 12.0 percent in 1970 to 6.4 percent in 1978.

- The S/E labor market demonstrates a notable amount of occupational mobility. About 175,000 persons who were qualified and working as scientists and engineers in 1972 had moved to either managerial or other non-S/E jobs by 1978.

- Movement out of the total labor force represents another source of outflow from the S/E labor market. Currently, about 37,000 scientists and engineers leave the labor force entirely each year. This annual outflow represents less than 2 percent of the 1978 S/E labor force.

- Between 1978 and 1980 the S/E population is expected to grow by about 240,000 (9 percent) to approximately 3 million. Life scientists are expected to show the largest relative growth (15 percent), and engineers the smallest (7 percent). The supply of scientists and engineers is forecast to increase between 1978 and 1980 more rapidly than the number who will be working in S/E jobs.

BEST DOCUMENT AVAILABLE

s/e flows

Chart 21 traces the flows within the S/E labor market. These flows act as equilibrating forces in the marketplace by limiting the duration of imbalances and providing the self-righting mechanisms needed to bring supply and demand into balance. Such mechanisms signal labor market conditions to individuals making career plans to those responsible for recruiting activities, those engaged in planning academic programs, and to persons responsible for developing Federal policies relating to science and technology.

The three flows examined in detail—the entrants of new graduates to the labor force, occupational mobility, and separations from the labor force—form the bulk of the supply changes in S/E labor markets. The flows not dealt with—reentrants of scientists and engineers from outside the labor force, entrants and reentrants from the non-S/E labor force, and immigration and emigration—are relatively small components of the total flows and are not expected to assume major roles in the future. Where possible, attempts are made to establish causal links between the flows and exogenous variables which created the disequilibrium conditions to which these flows responded. Finally, based on an analysis of the flows outlined, estimates of the 1980 supply and utilization of scientists and engineers are presented.

new entrants

Persons receiving S/E degrees are a potential source of supply to the S/E labor markets. The number earning S/E degrees, however, is not identical to the supply of new S/E workers. For various reasons, some who receive S/E degrees do not enter the S/E labor force. In some occupations, graduate education is usually a prerequisite for employment. Some S/E baccalaureates seek to enter professional schools in such fields as medicine, law, and business. Almost all those taking the medical school admission test have undergraduate S/E degrees (92 percent in 1977-78).[24] In the same year, 46 percent of those taking the graduate business school admission tests held S/E degrees. The proportion of persons earning undergraduate S/E degrees seeking to enter business schools has increased in recent years.[25]

In analyzing the flow of new graduates to the S/E labor market, two key variables are the numbers of S/E degrees granted, and the transition from school to work by those earning S/E degrees. Two important aspects of degree production are the responsiveness to labor market and demographic conditions, and the S/E field composition.

market and demographic factors and overall degree production

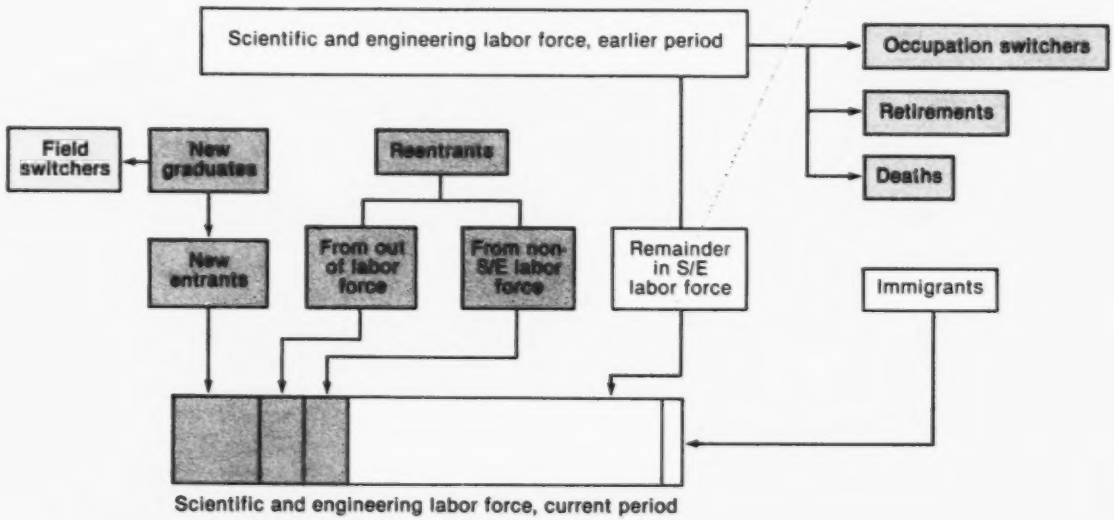
Young persons making education and career decisions are sensitive to the state of the labor market.[26] A positive relationship has been found between

[24] American Association of Medical Colleges, *Medical School Admission Requirements, U.S.A. and Canada, 1979* (Washington, D.C., 1979), pp. 5-6, 9.

[25] Educational Testing Service, unpublished data (Princeton, N.J.) Between 1973-74 and 1976-77, the proportion of natural S/E bachelor's-degree recipients taking the Graduate Business School Administration test rose from 19 percent to 30 percent.

[26] For more detailed discussions of this subject, see Richard B. Freeman, *The Market for College Manpower* (Cambridge, Mass.: Harvard University Press, 1971); "Supply and Salary Adjustments to the Changing Scientific Manpower Market, Physics 1948-75," *American Economic Review*, March 1975; and "A Cobweb Model of Supply and Starting Salary of New Engineers," *Industrial and Labor Relations Review*, January 1976.

Chart 21. Occupational labor market flows



SOURCE: National Science Foundation

BEST DOCUMENT AVAILABLE

the number of students pursuing and earning degrees in a specific field, and salaries and other indicators of relative economic opportunities in the field. Thus, when demand in a field exceeds supply, as evidenced by relatively high starting salaries or intensified recruitment activity, more students are likely to select that field of study. Over time, however, the supply of these additional entrants may exceed demand. Relative salaries will then decline, as will recruitment activities, and in turn, these signals will result in fewer persons entering the field's educational and training programs; then the processes will start over again.

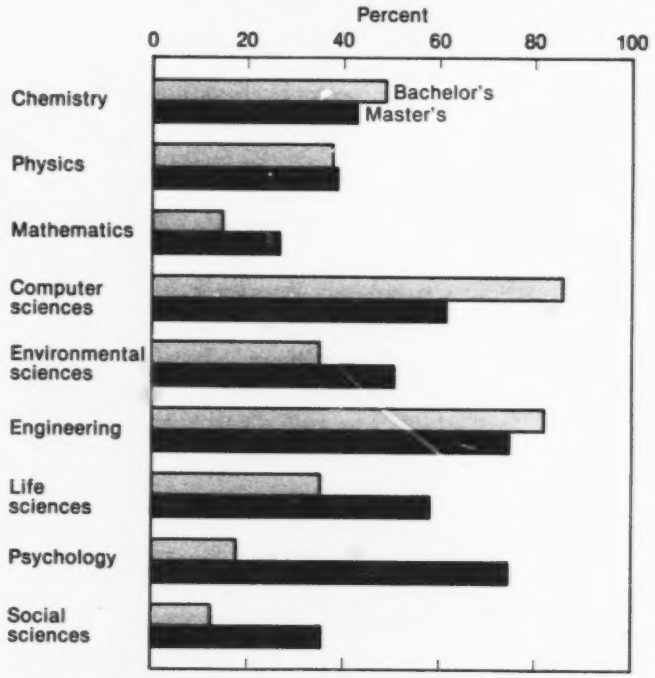
Engineering fields provide a clear example of repeated oscillation between "shortages" and "surpluses." In addition, recent research suggests similar oscillatory patterns in the fields of physics, mathematics, and chemistry.[37]

According to recent labor market indicators (chapter 1), job and salary opportunities remain relatively strong for engineers and computer specialists. Employment and salary statistics for recent S/E graduates confirm this impression. A followup survey of those who received bachelor's and master's degrees in 1976 revealed that bachelor's-degree graduates in computer sciences and engineering had the highest percentages employed in 1978 in the field of their degrees—85 percent and 80 percent, respectively. The next highest field, chemistry, had less than 50 percent of its bachelor's-degree recipients employed as chemists (chart 22). Engineering and computer sciences are also among the top fields with respect to both levels and rates of change in starting salaries. (See table on right.)

Intertwined with market factors are demographic factors—specifically the number of persons in the "baccalaureate-age" population (persons roughly 22 years of age). Between 1967 and 1970 the number of 22-year-olds increased from about 2.8 million to 3.5 million; this rise represents an average annual growth rate of 6.6 percent. From 1970 to 1976, population growth in this age group slowed to an average annual rate of 1.6 percent. This deceleration in the rate of growth of the "baccalaureate-age" population partially explains the deceleration in the rate of growth in total (i.e., S/E and non-S/E) degrees granted at all levels, observed since the mid-sixties. The deceleration in the rate of growth of total degrees at all levels, should, in turn, partially be reflected in a deceleration in the rate of growth in S/E degrees (charts 23 through 25). Moreover, anticipated trends in the population of 18-year-olds, from which college entrants are drawn, suggest further deceleration and possible decline in degree production in the eighties. The number of 18-year-olds increased by more than 8 percent between 1967 and 1976 and is expected to peak in 1979 by more than 15 percent through 1986.

The various market forces and demographic factors just discussed are reflected both in total degree production and in the number of S/E degrees. Between 1974 and 1978, the number of S/E bachelor's degrees awarded declined by about 6 percent. In contrast,

Chart 22. Proportion of new science/engineering graduates employed in occupation coincident with their field of highest degree: 1976 graduates in 1978



SOURCE: National Science Foundation; appendix tables B-37a and B-37b

Percent in average monthly salary offers to bachelor's-degree candidates in selected fields: 1973-74 to 1976-77

Curriculum	Average monthly salary offers		Percent Change
	1973-74	1976-77	
Business	$ 803	$ 927	15
Humanities	691	810	17
Social sciences	737	887[1]	20
Engineering			
Chemical	1,042	1,389	33
Civil	967	1,185	23
Electrical	986	1,245	26
Mechanical	1,001	1,286	28
Agricultural sciences	785	924	18
Biological sciences	720	882	22
Chemistry	884	1,102	25
Computer sciences	915	1,123	23
Mathematics	874	1,073	23

[1] Based on data in *CPC Salary Survey*.

SOURCES: *CPC Salary Survey, Final Report July 1976* and *July 1978* (Bethlehem, Pa.: College Placement Council), p. 3.

[37] See Richard B. Freeman and Jonathan Leonard, "Autoregressive Degree Patterns: Evidence of Endogenous Cycles in the Market," *Industrial Relations Research Association, Proceedings of the Thirteenth Annual Winter Meeting*, December 29-30, 1977, pp. 13-14.

BEST DOCUMENT AVAILABLE

the number had more than doubled between 1960 and 1970, and increased by almost 16 percent between 1970 and 1974.

In 1978 about 288,000 bachelor's degrees were granted in science and engineering. In addition, about 56,000 master's degrees and 17,000 doctorates were granted in S/E fields. However, unlike the patterns of the number of S/E bachelor's degrees, which show a decline starting in 1974, the number of S/E master's degrees leveled off from 1973 to 1976 and began to climb again in 1977 (chart 24). The pattern in the number of S/E doctorates was similar to that of S/E bachelor's degrees. After climbing steadily, but at a decreasing rate, the number peaked in 1973 and began to decline. By 1978 the number of S/E doctorates granted was about 7 percent below 1973 levels (chart 25).

These trends also have implications for the share of total degrees in all S/E fields. At the bachelor's level, this share was relatively stable at slightly above 30 percent until 1970, when it began to decline gradually (chart 23). By 1978, S/E bachelor's degrees represented about 29 percent of the total. For S/E master's degrees, the trend in shares declined steadily from 1965, when it stood at 30 percent, until 1976, when it rested at slightly more than 17 percent (chart 24). This trend was primarily the result of the dramatic decline in the share of engineering degrees, which dropped by more than 50 percent. A slight increase (2.7 percent) occurred between 1976 and 1978, but it is too soon to conclude from the statistics that the trend has reversed itself. Such a judgment must wait until several more years of data are available for analysis.

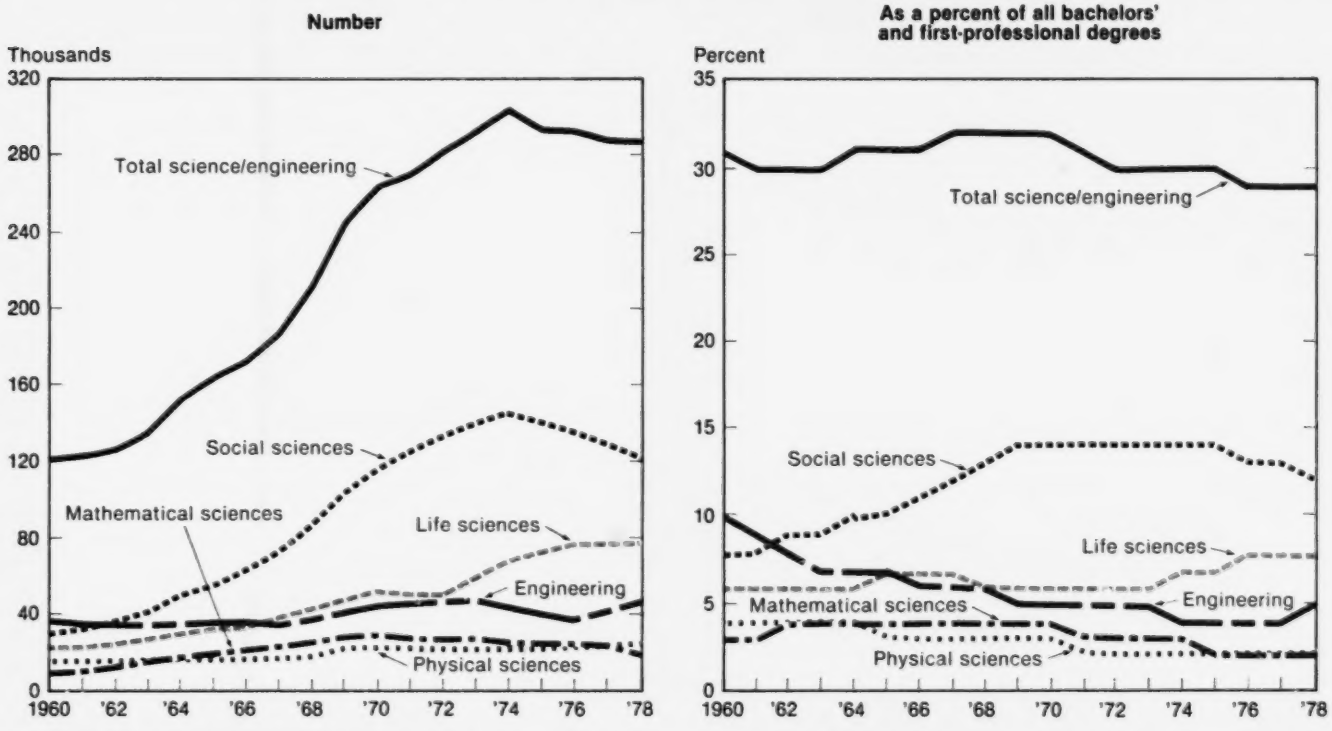
For S/E doctorates, the trend in shares roughly paralleled the trend exhibited by S/E master's degrees, declining from 64 percent in 1965 to 54 percent in 1976 and increasing slightly in 1977 and 1978. Again, the recent evidence for S/E doctorates is insufficient to support the conclusion of a trend reversal.

the propensity to attend graduate school

Both the number of S/E degrees granted and S/E degrees as a proportion of all degrees are declining. Moreover, projected demographic trends (particularly in the size of the college-age population) suggest that these declines will continue in the near future. An examination of the propensity of S/E baccalaureates to attend graduate school provide additional information on the nature of these declines.

The ratio of first-year S/E advanced degree enrollment to S/E bachelor's degrees granted during the previous academic year suggests that the propensity to attend graduate school is declining. For example, in the fall of 1965, the ratio amounted to about 0.65 per S/E bachelor's degree one year earlier. This "continuation rate" declined to about 35 percent in 1973, and rose slightly between 1973 and 1976, when it hovered around 40 percent.

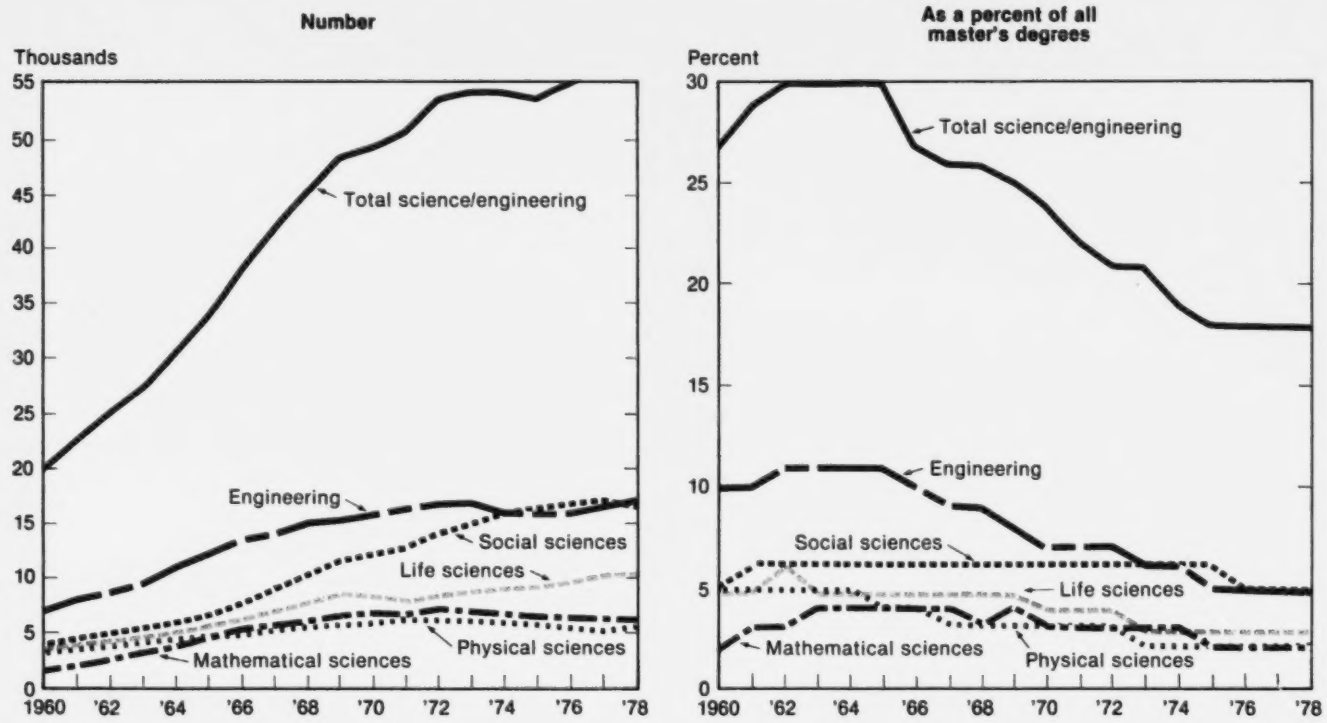
Chart 23. Bachelor's degrees awarded in science/engineering by field



SOURCE: National Science Foundation; appendix table B-31

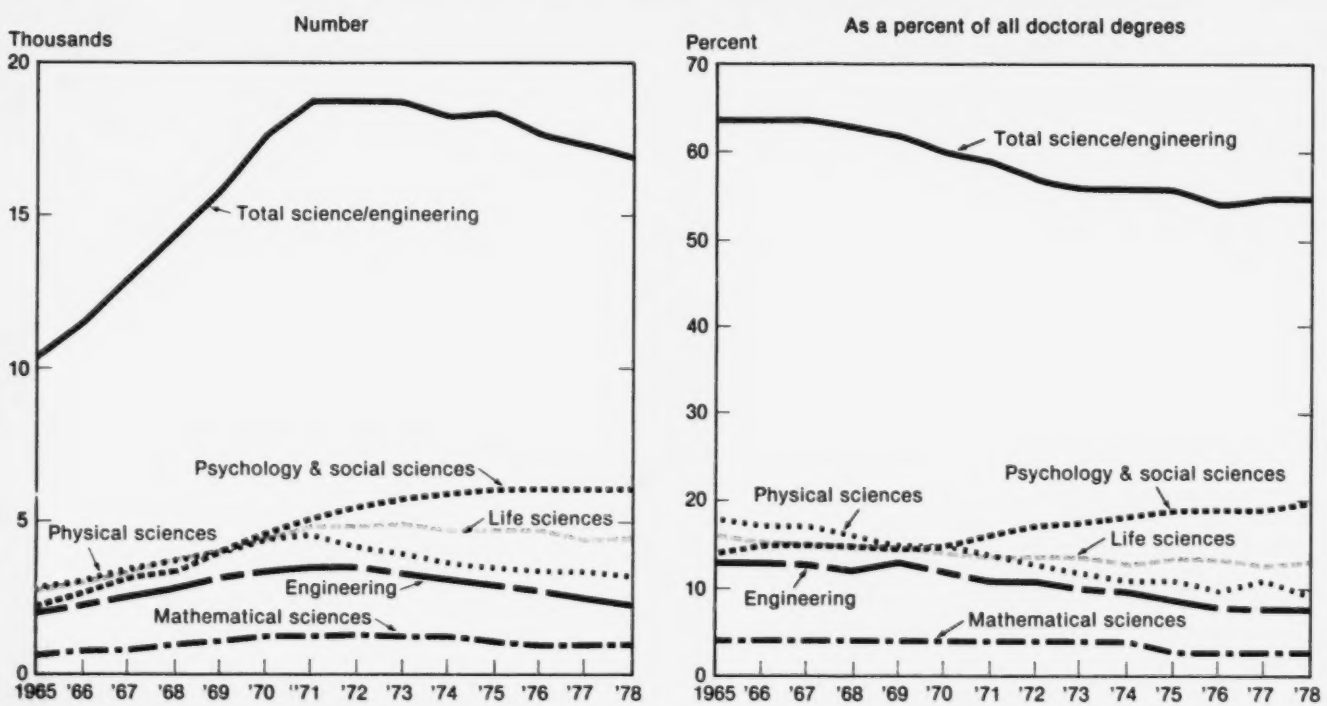
BEST DOCUMENT AVAILABLE

Chart 24. Master's degrees awarded in science/engineering by field



SOURCE: National Science Foundation; appendix table B-32

Chart 25. Doctoral degrees awarded in science/engineering by field



SOURCE: National Science Foundation; appendix table B-33

BEST DOCUMENT AVAILABLE

There were, of course, variations among the major fields of science (chart 26 and appendix table B-34). The drop in "continuation rates" is not so pronounced in non-S/E fields.

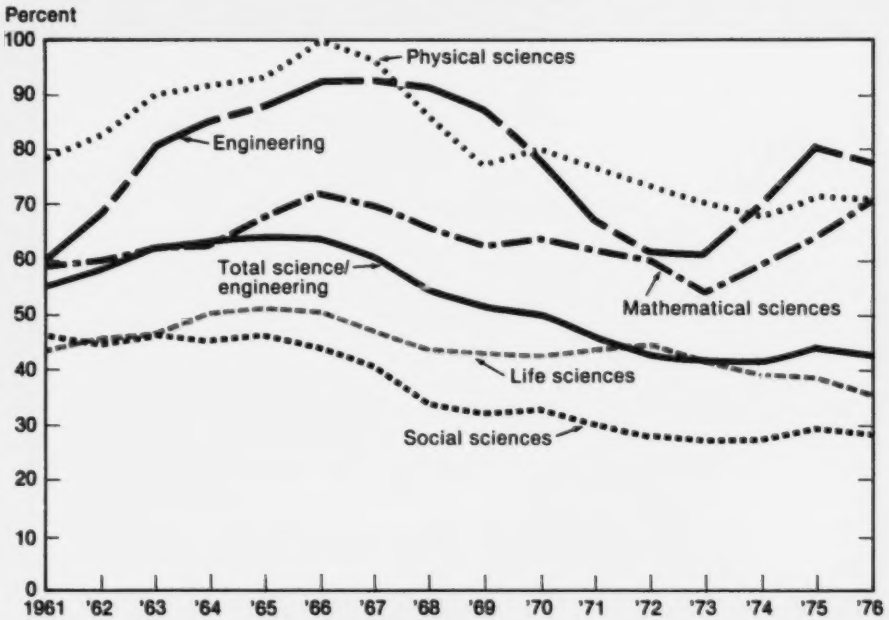
The decline in continuation rates is also reflected in the number of S/E doctorates awarded, which peaked in the early seventies. Both continuation and completion rate behavior are reflected in the ratio of the number of S/E doctorates awarded to the number of S/E bachelor's degrees awarded seven years earlier.[28] This ratio declined from 12.0 percent in 1970 to about 6.4 percent in 1977 (chart 27).

s/e degree fields

Earned degrees in the broad S/E fields have shown different growth rates over both the long and the short terms. Between 1960 and 1978, for example, bachelor's degrees awarded in engineering increased by about 25 percent (from 37,800 to 47,400), while the number of degrees awarded in the social sciences increased by almost 400 percent (from 31,500 to 120,500). Degrees in the physical and mathematical sciences peaked earlier than did degrees in the social sciences. The data in chart 30 indicate that persons began electing not to enter or complete graduate study in science and engineering (except social sciences) in the mid- to late sixties.

Between 1975 and 1978, bachelor's degrees in the physical and environmental sciences increased by about 11 percent, while social science degrees declined by about 13 percent. These short-term variations seem to reflect relative changes in opportunities in these fields. Thus, a surplus of physical scientists in the early seventies resulted in the production of fewer degrees in this field in the midseventies. When relative opportunities subsequently improved, the number of students entering physical science programs rose again. These students received bachelor's degrees in the late seventies.

Chart 26. Graduate school entry rates of science/engineering bachelor's-degree recipients by field



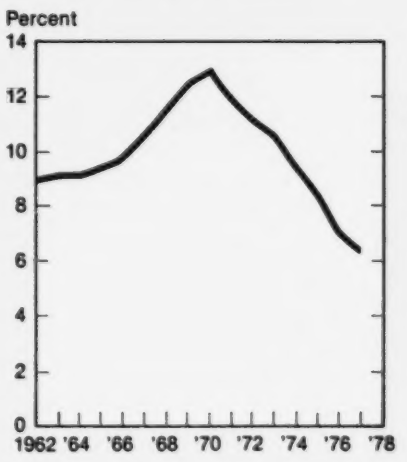
SOURCE: National Science Foundation; appendix table B-34

transition from school to work

More investment in schooling in a field is associated with a greater degree of attachment to the field and to science and engineering in general. While only one-third of the bachelor's-degree recipients worked in their fields of study two years after their graduation, four-fifths of the doctoral degree-holders obtained jobs in their fields, during a period when such persons faced limited openings of "appropriate" academic and research positions.

Chart 28 presents an overview of the transition made by recent S/E baccalaureates from school to work. In 1978 only 38 percent who graduated one and two years earlier were employed in science and engineering, while 46 percent held non-S/E jobs. A significant proportion (21 percent), however, was attending graduate school on a full-time basis. When these students are excluded from the analysis, a somewhat different picture develops. For those employed, about 45 percent held S/E jobs. Persons

Chart 27. Science/engineering doctoral degrees as a percent of science/engineering bachelor's degrees awarded seven years earlier



SOURCES: National Science Foundation; National Center for Education Statistics; appendix table B-35

[28] National Research Council, *Summary Report, Doctorate Recipients from United States Universities*, Annual Report (1968-78) (Washington, D.C., 1969-79). Median time lapse between receipt of baccalaureate and doctorate degrees through this period for S/E doctorate recipients has been about 7 years (table 2).

BEST DOCUMENT AVAILABLE

with degrees in the natural sciences and engineering (with a wide variation among S/E fields) showed a significantly greater propensity for obtaining jobs in S/E fields than did those with degrees in the social sciences.

Chart 22 shows the proportion of employed 1976 bachelor's- and master's-degree recipients who, in 1978, were employed in their fields of study.[29] The differences in field retention of new graduates, by level of degree, seem to stem from labor market conditions and general hiring practices. Chemists, engineers, and computer specialists had high field retention rates at the bachelor's-degree level. Graduates in these fields were often employed by private industry, which has not placed as great an emphasis on graduate degrees as have other sectors—particularly academia. Entry-level positions in fields such as physics, mathematics, psychology, and the social sciences have typically required graduate education, especially in the seventies, when labor market conditions enabled employers to raise their hiring standards. During this period,[30] some doctorates were being used to fill positions formerly held by nondoctorates, or new positions that could have been filled by nondoctorates, or new positions that could have been filled by nondoctorates in the preceding decade. These upgrading tendencies may reflect the increasing complexity of these jobs, but market conditions apparently are also at work.

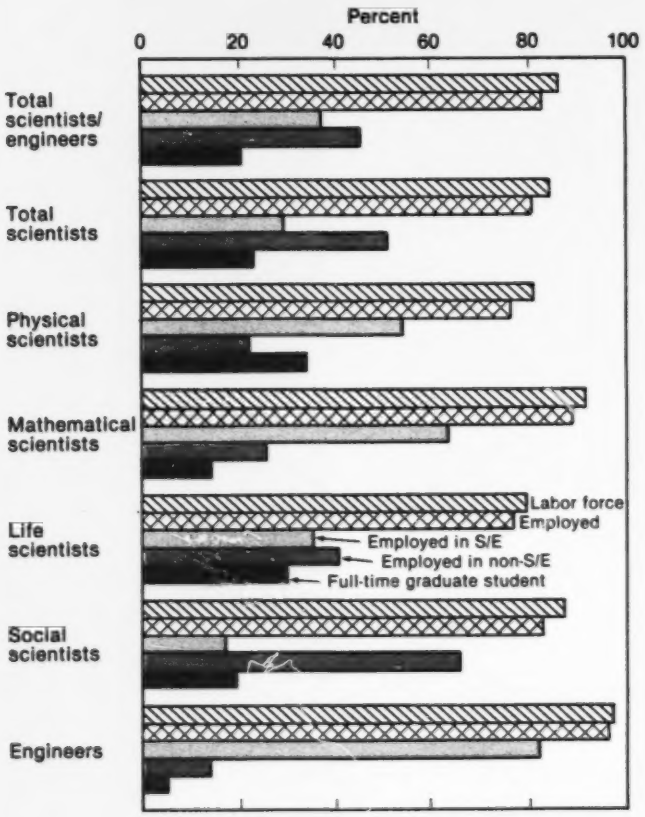
Men and women entering the labor market after graduation had essentially the same patterns of retention and mobility between field of study and employment. Men, however, showed a greater propensity to enter engineering fields from the natural sciences. Part of this difference may reflect the greater concentration (within the natural sciences) of men in the physcial (rather than the life) sciences. Women who received master's degrees in psychology were more apt to enter non-S/E occupations than were men, but there were no differences in the affinity between field of study and employment between men and women at the doctorate level.[31]

Chart 29 relates the numbers receiving a degree in a specific field to the number of new S/E-degree recipients who enter that occupation.[32] The ratio of these two numbers (expressed in percentage terms) is used as an index of market conditions for new degree recipients. Values near 100 suggest a balance between the jobs and new S/E graduates in that field. However, jobs are not necessarily filled by persons with degrees in a given field. Fields with values that exceed 100 suggest an excess of graduates to jobs; those with values below 100 suggest that graduates from other S/E fields are entering the occupation in significant numbers. For example, the index for physics is about 200 for both bachelor's and master's degrees, showing that for every 100 persons with either of these degrees in any S/E field finding jobs as physicists, about 200 persons received degrees in physics. The extremes in chart 29 are represented by social scientists and computer specialists. The number who received degrees in social sciences is six times the number (from all S/E fields) who found social science jobs. In contrast, the number with degrees in

[29] New S/E doctorate recipients are excluded from this discussion because the large majority have entered occupations related to their field of study without regard to labor market conditions.

[30] National Science Foundation, *National Patterns of R&D Resources: Funds & Manpower in the United States, 1953-77* (NSF 77-310), p. 20 and *1953—78-79* (NSF 78-313), p. 20 (Washington, D.C.: U.S. Government Printing Office).

Chart 28. Selected characteristics of 1976 science/engineering bachelor's-degree recipients in 1978



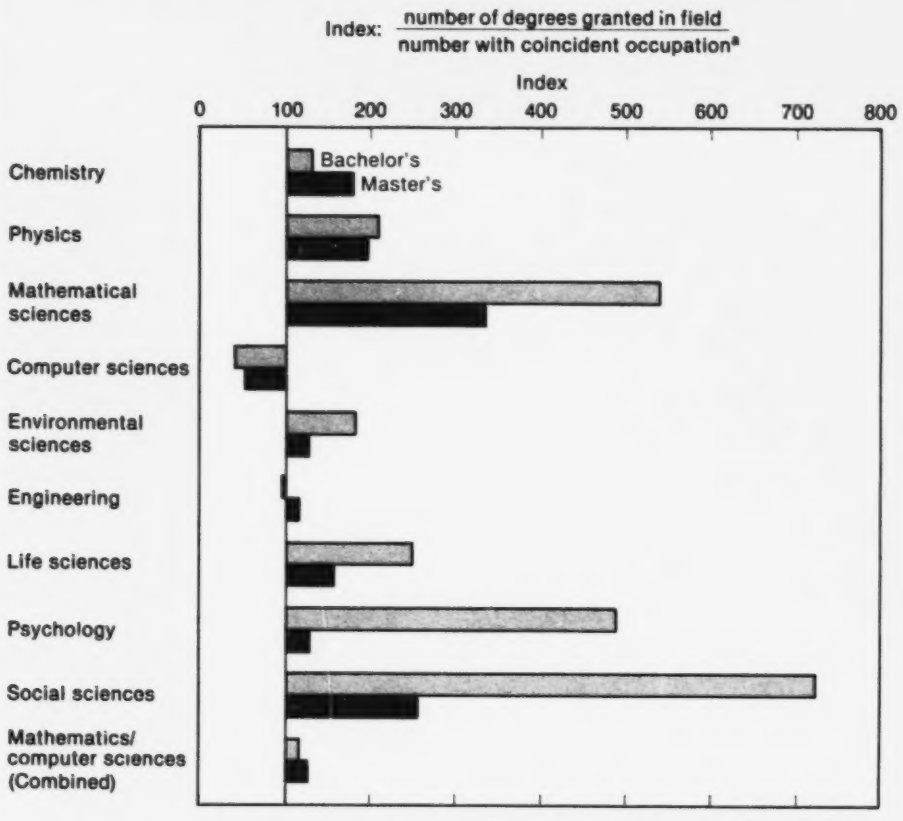
SOURCE: National Science Foundation; appendix table B-36

[31] For a discussion of new entrants see, National Science Foundation, "Employment Patterns of Recent Entrants into Science and Engineering, "*Reviews of Data on Science Resources*, No. 32 (Washington, D.C.: U.S. Government Printing Office, June 1978).

[32] No allowance has been made for non-S/E graduates (excluding doctorates) who may have obtained S/E jobs.

BEST DOCUMENT AVAILABLE

Chart 29. Science/engineering job market for science/engineering-degree recipients by field and degree level: 1976 recipients in 1978



[a]A value of 100 means that the number receiving a degree in field is equal to the number entering an occupation coincident with the specific field of study.
SOURCE: National Science Foundation; appendix table B-37

computer specialties was about one-half the number who found jobs in this field. However, when the closely associated fields of mathematics and computer sciences are combined, relative balance between degrees and jobs becomes apparent.

other entrants

Along with the new S/E graduates, other sources supply the S/E labor market: Entrants from outside the S/E labor force, entrants from outside the general labor force; and, finally, immigrants who have the requisite experience and education to become scientists or engineers. Data on these flows are incomplete and these inflows are not discussed in this report.

occupational mobility

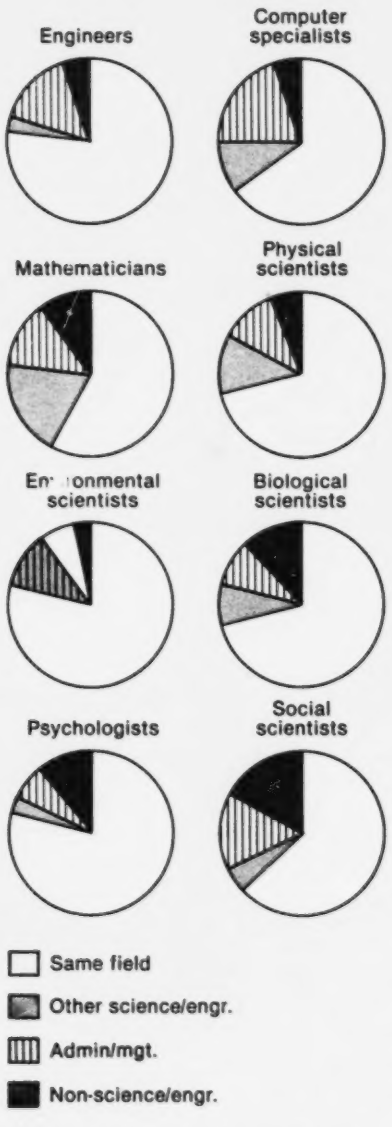
Mobility patterns operate on both the debit and credit sides of occupational supply. Although there are many aspects of mobility—industrial, geographic, and occupational—this assessment is concerned with occupational mobility. Occupational changes are a way for the labor market to equilibrate supply and demand, especially in the short run. Throughout the seventies,[33] NSF has been following a longitudinal sample of scientists and engineers who were queried about their labor market experiences. Although many (70 percent) changed jobs, only 20 percent changed their occupations. Of those changing occupations, one-fourth remained within the S/E labor force, one-half moved to management positions, and the remainder went to non-S/E jobs. Chart 30 summarizes the 1972-78 movements from S/E occupations to other S/E management, and non-SE occupations. The data show that about 26 percent moved to other occupations—10 percent to other S/E fields, 9 percent ot management jobs, and 7 percent to other non-S/E occupations. Doctoral-level scientists were less occupationally mobile than were nondoctorates. Engineers in general were less occupationally mobile than were scientists; how-

[33] National Science Foundation, *Characteristics of the National Sample of Scientists and Engineers, 1974. Part 1. Demographic and Educational* (NSF 75-333); *Part 2. Employment* (NSF-76-323); *Part 3. Geographic* (NSF-76-330) (Washington, D.C.: U.S. Government Printing Office); *Characteristics of Experienced Scientists and Engineers, 1976* (Detailed Statistical Tables) (NSF 78-305) and *1978* (NSF 79-322) (Washington, D.C.)

BEST DOCUMENT AVAILABLE

ever, since engineers were aggregated over all specialties, the mobility pattern of engineers does not reflect flows among engineering specialties. Engineers were also more apt than scientists to become managers and, within engineering, this tended to be truer among engineers at the bachelor's-degree level than among others. Among the scientists, mathematicians were the most occupationally mobile. There was a strong flow from mathematics, a field now in low demand, to the computer fields, which have recently shown strong demand. There was little movement between engineering and the sciences. Most engineers who changed occupations went into management jobs. Finally, there were only slight differences between men and women in the degree of occupational mobility.

Chart 30. Occupational mobility of scientists/ engineers: 1972-78



SOURCE: National Science Foundation; appendix table B-39

losses to the s/e labor market

Jobs vacated through death and retirement, or "attrition," represent one of the chief sources of opportunities for new entrants. In a work force characterized by steady long-term growth and a balanced age distribution, attrition from deaths and retirements would amount to about 2.5 percent annually (based on a 40-year working life). In recent S/E labor markets, however, there have been disproportionately fewer older workers because of the rapid expansion of jobs in the fifties and sixties. Calculations made with unpublished Bureau of Labor Statistics data suggest that attrition in the late seventies probably amounted to approximately 1.5 percent of the S/E labor force.[14] Thus, with a current S/E labor force of approximately 2.5 million, about 37,000 should be leaving each year because of death and retirement. Estimated attrition rates vary for specific occupations, ranging from 2.5 percent for mining engineers—a slowly growing occupation in the sixties and early seventies—less than 1 percent for computer specialists.

S/E attrition rates depend on three factors—age distribution, life expectancy, and length of time people choose to work. With regard to age, a sharp rise in S/E attrition rates may result around 1990, when many of those scientists and engineers who started work during the fifties reach retirement age. Life expantancy, probably the least important factor, may lower attrition slightly because of the slight decrease in age-specific probabilities of death. Potentially more immediate and significant effects on attrition could come from changes in the length of time that scientists and engineers choose to remain in the labor force.

Statistics show a trend toward lowered retirement age. According to unpublished BLS data, the continuation of this trend could, by itself, add one-half a percentage point to the annual 1.5 percent attrition rate of the S/E work force by 1985. The trend may be counteracted, however, by the passage of Federal legislation and by the state of the economy. In 1978 Congress passed the Age Discrimination in Employment Act Amendments, which prohibit compulsory retirement before age 70. Since the amendments will enable some older scientists and engineers to work more years, a decrease in attrition could result. Moreover, price instabilities coupled with annual inflation rates exceeding 10 percent make potential retirees uncertain of the future purchasing power of their pensions, and this uncertainty makes these people reluctant to opt for early retirement.

The net effect of these factors on future S/E labor force attrition rates is difficult to assess. In view of the state of the economy, however, it is doubtful that the trend toward lowered retirement age will continue. Thus, one might expect a stable or a slowly decreasing rate of attrition in the S/E labor force during the eighties and nineties, stemming largely from retirement behavior in the eighties and the changing composition of the labor force in the nineties.

estimates of 1980 s/e labor market conditions

The S/E labor market flows just presented provide the basis for estimating the 1980 level of S/E supply. Levels of S/E utilization are more difficult to estimate because of the uncertainties surrounding the expected health of the economy in 1980.

[14] The Bureau of Labor Statistics information applies separation rates by age for all men and women in the labor force to the age distribution by sex of each occupation. Therefore, the BLS rates do not reflect any possible differences between separation patterns by age for scientists and engineers as compared to all workers. See, for example, Howard N. Fullerton, Jr., "A New Type of Working Life Table for Men," *Monthly Labor Review* (July 1972).

BEST DOCUMENT AVAILABLE

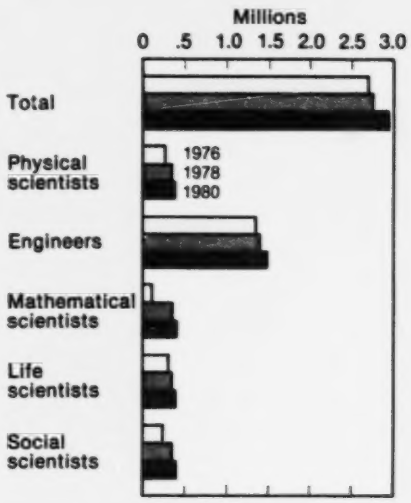
supply

The S/E population for 1980 is estimated at almost 3 million, about 9 percent above comparable 1978 levels. By comparison, the U.S. population 20 to 64 years of age is projected to rise by only 5 percent between 1978 and 1980. Thus, an increasingly larger fraction of the Nation's human resources is expected to have S/E skills.

Between 1978 and 1980 the largest relative growth is estimated for life scientists (up about 15 percent). Engineers are projected to show the least amount of relative growth (7 percent) over the same period (chart 31).

Almost all inexperienced entrants to the national S/E supply are products of American universities and colleges. Experienced workers enter science and engineering from non-S/E fields by immigration and upgrading of technicians. Most new scientists and engineers leave school and enter the labor force with only baccalaureate preparation. NSF estimates that total degrees awarded at this level will remain roughly constant between 1978 and 1980. Within this total, shifts in the shares held by each field are anticipated.[35] Degrees in the life sciences are projected to continue their steady, long-term climb between 1978 and 1980, and engineering baccalaureate totals are expected to reverse their decline of recent years. Conversely, NSF projects continued decreases in the number of baccalaureates in the social and mathematical sciences. Bachelor's degrees in the physical sciences are not expected to change significantly between 1978 and 1980, because greater female participation in this field may roughly counterbalance declining male totals.

Chart 31. Supply of scientists and engineers: 1976, 1978, and 1980



SOURCE: National Science Foundation; appendix table B-40

Since 1974 the flow of foreign scientists into the S/E population under current U.S. immigration policies has been small—less than 9,000 per year. Only in engineering have relatively large numbers been able to gain admittance. From 1975 through 1977, about 5,000 foreign engineers were admitted annually.[36] The projected tight market (demand exceeds supply) in this field should permit comparable numbers of immigrant engineers to continue to enter. In 1980, immigration is not expected to increase substantially from current levels or 1,000 or less in each of the four broad fields of science.

Losses to the S/E population result from retirement, death, and changes in labor market status of scientists and engineers who, because of changes in work activities and professional identification, are no longer considered part of the S/E population. A more restricted estimate of losses can be derived by including only labor force attrition; that is, those no longer in the active labor force because of death or retirement. An estimated 75,000 scientists and engineers are expected to be in this category between 1978 and 1980.

utilization

Because of the expected slowdown in economic activity in 1980, growth in S/E employment between 1978 and 1980 is not likely to continue the 4-percent growth rate that was observed over the 1976-78 period. Given the expected 9-percent growth in supply between 1978 and 1980, the gap between S/E labor force and S/E utilization can thus be expected to widen from the 17-percent level estimated in 1978. Because of uncertainties concerning the timing and magnitude of the business downturn expected before the end of 1980, it is difficult to estimate how much the gap will widen. For similar reasons, no attempt has been made to estimate employment levels or non-S/E utilization rates by broad field.

[35] National Science Foundation, *Projections of Science and Engineering Doctorates Supply and Utilization: 1982 and 1987* (NSF 79-303) (Washington, D.C.: U.S. Government Printing Office, 1979).

[36] National Science Foundation, based on data from the U.S. Immigration and Naturalization Service.

BEST DOCUMENT AVAILABLE

appendixes

a. technical notes
b. statistical tables

BEST DOCUMENT AVAILABLE

appendix a

technical notes

concepts and definitions

Estimates of the number, type of employer, primary work activity, and general economic and demographic characterists of scientists and engineers are derived by integrating several sources representing the following three groups:

Group 1—Experienced scientists and engineers (excluding holders of doctorates), defined, first, as having worked as a scientist or engineer or in a related occupation, at the time of the 1970 Decennial Census of Population; second, must have passed two of the following three criteria to have been included in estimates subsequent to 1970: (a) occupation in science or engineering, (b) highest degree held in science or engineering (c) professional identification as scientist or engineer.

Group 2—New entrants to science and engineering, defined as having received, after 1970, a master's degree in mathematics, biological science, psychology, economics, sociology, or other social science; or held a bachelor's degree in any of these fields and was employed in science and engineering; or held a baccalaureate in any of the other S/E fields.

Group 3—Doctoral scientists and engineers, defined as having received a doctorate in science or engineering, or having received a doctorate in non-S/E fields but employed in an S/E position.

These estimates are developed as part of the National Science Foundation's Scientific and Technical Personnel Data System (STPDS).

The STPDS include three basic data collection activities which relate to the three groups outlined above.

Group 1—*The Experienced Sample of Scientists and Engineers* consisting of about 50,000 individuals (3.5 percent sample), was drawn from those scientists and engineers who were in the employed labor force at the time of the 1970 decennial census. Information on this group was collected in 1972, 1974, 1976, and 1978 by the Bureau of the Census.

Group 2—*The New Entrants Surveys* are designed to measure the magnitude and characteristics of scientists and engineers who have entered the S/E labor force since the 1970 decennial census. Samples (about 2 percent) of the graduating classes of 1971, 1972 and 1973 were surveyed by the Laboratory for Research in Higher Education, University of California, Los Angeles, in 1974. The classes of 1974 and 1975 were sampled (about 2 percent) and surveyed in 1976 by Westat, Inc. In 1978 Westat, Inc. conducted surveys of the 1972 and 1976 classes (about 2 percent).

Group 3—*The Roster of Doctoral Scientists and Engineers*, maintained by the Commission on Human Resources, National Research Council consists of all known doctoral scientists and engineers in the United States starting with those of 1930. The roster serves as a panel from which a sample of about 60,000 scientists and engineers (20 percent sample) covering the years 1934-76 were selected to provide data on the doctoral population of the Nation.

Occupation/field of science or engineering

Data on field of science or engineering are derived from responses to questions on the various surveys described above. The various questionnaires are reproduced in the publications listed under "Data Sources" below.

Major fields of sciences included in the broad fields, e.g., physical sciences, are:

Physical sciences: Chemistry, physics, astronomy, and other physical scientists including metallurgy.

Environmental sciences: Earth, atmospheric and oceanographic sciences including geophysics, geology, seismology, and meteorology.

Life sciences: Agricultural, biological and medical sciences (excluding those primarily engaged in patient care).

Mathematical sciences: Mathematics and statistics.

Social sciences: Economics, including agricultural economics, sociology, anthropology, and all other social scineces.

Computer specialties.

Engineering.

Data on field of employment are derived from responses to questions which request—based on employment specialties lists included with the questionnaires—the name of the specialty most closely related to the respondent's principal employment. Those

BEST DOCUMENT AVAILABLE

who select an employment specialty not in science or engineering are assigned to a field of science or engineering based on the field of their degree and (for those with less than a Ph.D.) professional self identification.

primary work activity

Data presented on the work activities of S/E's represent the primary work activities of individuals and are derived from responses to a series of questions on the survey instruments which ask the individuals to provide: (1) a percent distribution of their work time among approximately 10 to 15 activities listed on the various instruments as of a specific reference week; and (2) to specify their primary work activity.

other variables

Information on other economic and demographic variables such as type of employer, race, sex, etc., are based on individual responses to survey questions. The various survey instruments used by the Division of Science Resources Studies are similar.

reliability of scientist and engineer estimates

Since the data on scientists and engineers are derived from sample surveys, the estimates are subject to both sampling and nonsampling errors.

The sample used for a survey is only one of a large number of possible samples of the same size that could have been selected using the same sample design. Even if the same questionnaire and instructions were used, the estimate from each of the samples would differ from each other. The deviation of a sample estimate from the average of all possible samples is defined as sampling error. The standard error of a survey estimate attempts to provide a measure of this variation and thus, is a measure of the precision with which an estimate from the sample approximates the average results of all possible samples. Information on standard errors for the major S/E data series used in this report can be found in the appropriate publications listed below.

Nonsampling errors can be attributed to many sources: inability to obtain information about all cases, definitional difficulties; differences in the interpretation of questions; inability or unwillingness to provide correct information on the part of respondents; mistakes in recording or coding the information; and other errors of collection, response, processing, coverage, and imputation. Nonsampling errors are not unique to sample surveys, since they can, and do, occur in complete canvasses as well. No systematic attempt has been to identify or approximate the magnitude of the nonsampling errors associated with the estimates of scientists and engineers presented in this report.

data sources

Details on survey methods, coverage, concepts, definitions, and reliability of the estimates associated with the above-mentioned data are contained in those complete NSF reports associated with each aspect of the S/E labor force.

See the following for descriptions of data:

Characteristics of Doctoral Scientists and Engineers in the United States, 1977 (Detailed Statistical Tables) (NSF 79-306).

Characteristics of Experienced Scientists and Engineers, 1976 (Detailed Statistical Tables) (NSF 78-305).

Reviews of Data on Science Resources, No. 36, "Employment Characteristics of Recent Science and Engineering Graduates: The Effects of Work Experience, Advanced Degrees, and Business Cycles" (NSF 80-311).

U.S. Scientists and Engineers: 1978 (Detailed Statistical Tables) (NSF 80-304).

For a brief description of each survey and copies of the survey instruments see: *A Guide To NSF Science Resources Data*, available from Editorial and Inquiries Unit, Division of Science Resources Studies, (L-611) National Science Foundation, Washington, D.C. 20550.

BEST DOCUMENT AVAILABLE

appendix b

statistical tables

Current Supply and Utilization Patterns of S/E Population

B-1. Scientists and engineers by field, employment status, and sex: 1974, 1976, and 1978 29

B-2. Scientists and engineers by field, labor force status, and sex: 1974, 1976, and 1978 29

B-3. Scientists and engineers by field, sex, and type of employer: 1974, 1976, and 1978 30

B-4. Scientists and engineers by field, sex, and type of employer: 1978 30

B-5. Scientists and engineers by field, sex, and primary work activity: 1974, 1976, and 1978 31

B-6. Scientists and engineers by field, sex, and primary work activity: 1978 ... 32

B-7. Salaries and annual growth rates for professional, technical, and kindred workers and scientists and engineers: 1974-78 33

B-8. Median annual salaries of 1972 S/E bachelor's-degree recipients by field and level of highest degree: 1978 33

B-9. Median annual salaries of experienced scientists and engineers by field, sex, and race: 1974, 1976, and 1978 33

B-10. Median annual salaries of experienced scientists and engineers by field, sex, and race: 1978 33

B-11. Unemployment rates: 1976-1978 33

B-12. GNP real growth and engineer unemployment rate (lagged one year): 1965-78 34

B-13. Scientists and engineers by field, employment status, and race: 1974, 1976, and 1978 34

B-14. Scientists and engineers by field, labor force status, and race: 1978 35

Doctoral Scientists and Engineers

B-15. Characteristics of the total population of doctoral scientists and engineers in the U.S. 36

B-16. Selected characteristics of employed doctoral scientists and engineers in the U.S. 37

B-17. Selected characteristics of doctoral scientists and engineers by labor force participation and unemployment rates: 1973-77 38

B-18. Employed doctoral scientists and engineers by field and type of employer: 1973, 1975, and 1977 38

B-19. Doctoral scientists and engineers by primary work activity and type of employer: 1973, 1975, and 1977 39

B-20. Percent of 1976 cohort of science/engineering doctorates primarily engaged in R&D activities by type of employer: 1977 39

B-21. Selected characteristics of employed women doctoral scientists and engineers in the U.S. 40

B-22. Median annual salaries of doctoral scientists and engineers by field and sex: 1977 41

B-23. Median annual salaries of doctoral scientists and engineers by field and type of employer: 1973, 1975, and 1977 41

B-24. Doctoral scientists and engineers by field and race: 1977 41

B-25. Doctoral scientists and engineers by type of employer, primary work activity, and race: 1977 41

B-26. Projected changes in doctoral scientists and engineers: 1977-87 42

B-27. Percent of science/engineering doctorates in non-science/engineering employment: projections 42

B-28. Projected full-time labor force of doctoral scientists: 1982 and 1987 42

Dynamics of S/E Labor Market

B-29. Bachelor's and first-professional degrees awarded by field: 1960-78 43

B-30. Master's degrees awarded by field: 1960-78 44

B-31. Doctoral degrees awarded by field: 1965-78 45

B-32. Graduate school entry rates of science/engineering bachelor's-degree recipients: 1961-76 45

B-33. Doctoral degrees awarded in science and engineering as a percent of science/engineering bachelor's degree-awarded seven years earlier: 1962-77 46

B-34. Distribution of selected activities of 1976 science/engineering bachelor's-degree recipients in 1978 46

B-35. Employed 1976 science/engineering graduates by field and level of degree, and field of employment in 1978 47

B-36. Percent distribution of employed 1976 science/engineering graduates by field and level of degree, and field of employment in 1978 47

B-37. Immigrant scientists and engineers by continent of last permanent residence: FY 1966-77 48

B-38. Occupational mobility: 1972 scientists and engineers as employed in 1978 48

B-39. Supply of scientists and engineers: 1976, 1978, and 1980 48

BEST DOCUMENT AVAILABLE

Table B-1. Scientists and engineers by field, employment status, and sex: 1974, 1976, and 1978

Field	Total			Total labor force			Outside labor force		
	1974	1976	1978	1974	1976	1978	1974	1976	1978
Total, all fields	2,481,800	2,705,800	2,741,400	2,288,000	2,451,700	2,507,600	193,800	254,100	233,800
Men	2,265,000	2,455,800	2,475,300	2,104,700	2,240,000	2,270,400	160,300	215,800	204,900
Women	216,800	250,000	266,100	183,300	211,700	237,200	33,500	38,300	28,900
Physical scientists	247,900	280,600	254,600	206,500	237,300	216,700	41,400	43,300	37,900
Men	227,200	254,100	231,800	189,900	215,800	200,700	37,300	38,300	31,100
Women	20,700	26,500	22,800	16,600	21,500	16,000	4,100	5,100	6,800
Mathematical scientists	101,000	110,200	107,800	84,500	92,200	89,800	16,500	18,000	18,000
Men	81,000	87,200	88,000	70,600	76,000	71,800	10,400	11,200	16,200
Women	20,000	22,900	19,800	13,900	16,200	18,000	6,100	6,800	1,800
Computer specialists	170,000	179,900	237,500	167,100	173,500	234,600	2,900	6,400	2,900
Men	135,400	143,500	194,800	135,400	139,500	193,900	(1)	4,000	900
Women	34,600	36,400	42,700	31,700	34,000	40,600	2,900	2,400	2,100
Environmental scientists	79,000	85,700	80,800	71,500	77,400	73,900	7,500	8,300	6,900
Men	73,700	79,300	72,200	67,100	73,000	66,200	6,600	6,300	6,000
Women	5,300	6,400	8,600	4,400	4,400	7,800	900	2,000	900
Engineers	1,291,600	1,375,200	1,396,400	1,228,600	1,268,000	1,285,000	63,000	107,200	111,300
Men	1,284,900	1,366,900	1,374,600	1,224,200	1,261,000	1,264,500	60,700	105,900	110,100
Women	6,700	8,300	21,700	4,400	7,000	20,500	2,300	1,300	1,200
Life scientists	266,000	314,100	327,600	243,400	286,300	295,800	22,600	27,800	31,800
Men	214,100	253,300	255,400	197,400	232,700	231,500	16,700	20,600	23,900
Women	51,900	60,800	72,200	46,000	53,700	64,300	5,900	7,200	7,900
Psychologists	109,300	122,900	131,700	94,000	105,700	123,200	15,300	17,200	8,500
Men	84,200	92,300	95,700	73,000	80,000	91,100	11,200	12,300	4,600
Women	25,100	30,700	36,000	21,000	25,700	32,100	4,100	4,900	3,900
Social scientists	217,000	237,200	205,100	192,400	211,400	188,500	24,600	25,600	16,600
Men	164,000	179,200	162,800	147,100	162,100	150,600	16,900	17,100	12,200
Women	53,000	58,000	42,200	45,300	49,300	37,800	7,700	8,600	4,400

(1) Too few cases to estimate.
NOTE: Detail may not add to total because of rounding.
SOURCE: National Science Foundation

Table B-2. Scientists and engineers by field, labor force status, and sex: 1974, 1976, and 1978

Field	Total employed			In S/E			Outside S/E			Unemployed but seeking employment		
	1974	1976	1978	1974	1976	1978	1974	1976	1978	1974	1976	1978
Total, all fields	2,248,200	2,377,200	2,473,200	NA	2,090,300	2,091,900	NA	286,800	381,300	39,800	74,600	34,400
Men	2,072,100	2,199,900	2,241,700	NA	1,914,500	1,914,400	NA	265,600	284,300	32,600	60,100	28,700
Women	176,100	197,200	231,500	NA	175,900	175,900	NA	21,300	97,000	7,200	14,500	5,700
Physical scientists	201,400	227,400	212,400	NA	189,400	184,700	NA	38,000	27,600	5,100	9,900	4,300
Men	185,500	207,500	197,400	NA	176,400	174,400	NA	31,100	22,900	4,400	8,400	3,400
Women	15,900	19,900	15,000	NA	13,100	10,300	NA	6,900	4,700	700	1,500	1,000
Mathematical scientists	82,800	88,300	88,400	NA	85,700	42,900	NA	2,600	45,600	1,700	3,900	1,400
Men	69,300	72,700	70,900	NA	70,300	38,100	NA	2,300	32,700	1,300	3,300	900
Women	13,500	15,600	17,500	NA	15,300	4,800	NA	300	12,800	400	500	500
Computer specialists	166,200	172,300	234,000	NA	167,200	231,400	NA	5,200	2,500	900	1,200	600
Men	134,900	138,700	193,400	NA	134,400	191,100	NA	4,300	2,200	500	800	600
Women	31,300	33,600	40,600	NA	32,700	40,300	NA	900	300	400	400	100
Environmental scientists	69,100	74,800	72,200	NA	52,000	62,400	NA	22,900	9,900	2,400	2,600	1,700
Men	64,800	71,100	64,600	NA	49,900	57,500	NA	21,200	7,100	2,300	1,800	1,600
Women	4,300	3,700	7,700	NA	2,100	5,000	NA	1,600	2,700	100	700	100
Engineers	1,212,600	1,240,700	1,268,400	NA	1,123,400	1,201,200	NA	117,300	67,200	16,000	27,200	16,700
Men	1,208,300	1,234,000	1,248,500	NA	1,117,600	1,183,400	NA	116,500	65,100	15,900	26,900	16,000
Women	4,300	6,700	19,800	NA	5,800	17,800	NA	900	2,100	100	300	700
Life scientists	238,600	277,500	291,000	NA	224,900	201,800	NA	52,600	89,100	4,800	8,800	4,900
Men	193,400	226,000	227,800	NA	176,400	165,600	NA	49,600	62,100	4,000	6,600	3,800
Women	45,200	51,400	63,200	NA	48,500	36,200	NA	2,900	26,900	800	2,200	1,200
Psychologists	89,600	97,800	120,900	NA	84,200	71,200	NA	13,500	49,700	4,400	8,000	2,300
Men	71,500	76,700	89,700	NA	64,600	58,200	NA	12,100	31,500	1,500	3,300	1,400
Women	18,100	21,100	31,200	NA	19,700	13,100	NA	1,400	18,200	2,900	4,700	900
Social scientists	187,900	198,300	186,000	NA	163,600	96,200	NA	34,700	89,800	4,500	13,100	2,500
Men	144,500	153,200	149,500	NA	124,900	89,000	NA	28,300	60,500	2,700	9,000	1,100
Women	43,400	45,200	36,400	NA	38,700	7,200	NA	6,400	29,300	1,800	4,200	1,400

NA: Not available
NOTE: Detail may not add to total because of rounding.
SOURCE: National Science Foundation

BEST DOCUMENT AVAILABLE

Table B-3. Scientists and engineers by field, sex, and type of employer: 1974, 1976, and 1978

Field	Total			Business & industry			Educational institutions			Federal Government			All other		
	1974	1976	1978	1974	1976	1978	1974	1976	1978	1974	1976	1978	1974	1976	1978
Total, all fields	2,248,200	2,377,200	2,473,200	1,376,200	1,433,100	1,528,100	341,300	370,700	380,800	189,100	205,600	205,800	341,500	367,800	358,400
Men	2,072,100	2,179,900	2,241,700	1,313,800	1,362,600	1,445,300	288,200	312,100	304,800	175,500	189,700	187,300	294,500	315,600	304,600
Women	176,100	197,200	231,500	62,400	70,500	82,700	53,100	58,600	76,000	13,600	15,900	18,600	47,000	52,200	54,000
Physical scientists	201,400	227,400	212,400	98,000	108,700	116,300	47,400	54,100	55,500	19,600	22,800	18,000	36,400	41,700	22,600
Men	185,500	207,500	197,400	89,300	99,000	108,400	44,200	49,400	51,500	18,800	21,100	16,900	33,200	38,000	20,500
Women	15,900	19,900	15,000	8,700	9,700	7,900	3,200	4,700	4,000	800	1,800	1,100	3,200	3,900	2,100
Mathematical scientists	82,800	88,300	88,400	32,000	33,600	34,200	31,900	34,600	35,100	7,900	8,700	9,400	11,000	11,300	9,700
Men	69,300	72,700	70,900	27,000	27,900	25,600	28,100	29,800	28,600	6,100	6,600	8,800	8,100	8,400	7,800
Women	13,500	15,600	17,500	5,000	5,700	8,600	3,800	4,800	6,500	1,800	2,100	600	2,900	3,000	1,800
Computer specialists	166,200	172,300	233,900	121,600	125,900	173,000	13,400	13,800	17,900	13,900	14,300	14,600	17,300	18,200	28,800
Men	134,900	138,700	193,400	99,100	101,600	145,100	10,600	10,900	13,900	11,300	11,600	12,300	13,900	14,600	22,300
Women	31,300	33,600	40,600	22,500	24,300	27,800	2,800	2,900	4,000	2,600	2,800	2,300	3,400	3,800	6,600
Environmental scientists	69,100	74,800	72,300	36,200	40,400	40,400	10,100	11,100	12,900	10,600	11,100	10,400	12,100	12,200	8,600
Men	64,800	71,100	64,600	34,800	38,900	36,000	9,100	10,500	11,300	9,600	10,500	9,500	11,200	11,200	7,900
Women	4,300	3,700	7,700	1,400	1,500	4,400	1,000	600	1,600	1,000	600	900	900	900	700
Engineers	1,212,600	1,240,700	1,268,400	939,600	959,700	985,400	43,100	43,900	48,700	95,100	97,500	90,600	134,800	139,500	143,700
Men	1,208,300	1,234,000	1,248,500	936,700	955,100	969,100	42,900	43,600	47,700	94,700	96,900	89,200	134,000	138,400	142,500
Women	4,300	6,700	19,800	2,900	4,600	16,300	200	300	900	400	700	1,400	800	1,100	1,200
Life scientists	238,600	277,500	291,000	89,500	102,000	86,400	75,300	86,100	94,400	17,900	25,600	41,800	55,900	63,700	68,200
Men	193,400	226,000	227,800	78,000	88,300	77,300	56,300	65,500	65,500	16,000	23,100	35,500	43,100	49,000	49,600
Women	45,200	51,400	63,200	11,500	13,700	9,100	19,000	20,700	28,900	1,900	2,500	6,400	12,800	14,600	18,800
Psychologists	89,600	97,800	120,900	17,700	18,700	31,600	39,300	42,900	55,300	5,100	5,400	4,000	27,500	30,700	29,900
Men	71,500	76,700	89,700	14,100	14,800	28,500	33,700	36,100	36,000	4,500	4,700	3,100	19,200	21,200	22,100
Women	18,100	21,100	31,200	3,600	3,900	3,000	5,600	6,700	19,400	600	700	900	8,300	9,600	7,900
Social Scientists	187,900	198,300	186,000	41,600	44,100	60,800	80,800	84,300	61,300	19,000	20,000	17,000	46,500	49,900	46,700
Men	144,500	153,200	149,500	34,800	37,000	55,300	63,300	66,300	50,200	14,500	15,300	12,000	31,800	34,600	31,900
Women	43,400	45,200	36,500	6,800	7,100	5,600	17,500	17,900	11,100	4,500	4,700	5,000	14,700	15,400	14,900

[1] Includes nonprofit organizations; military; State, local, and other government; other and no report.

NOTE: Detail may not add to total because of rounding.

SOURCE: National Science Foundation

Table B–4. Scientists and engineers by field, sex, and type of employer: 1978

Field	Total	Business industry	Educational institutions	Nonprofit orgs.	Federal Gov't	Military	State and local gov't	Other gov't	Other	No report
Total, all fields	2,473,200	1,528,100	380,800	80,000	205,800	20,600	145,300	58,300	16,600	37,600
Men	2,214,700	1,445,300	304,800	60,500	187,300	20,300	122,400	55,500	10,800	35,100
Women	231,500	82,700	76,000	19,600	18,600	200	23,000	2,800	5,900	2,500
Physical scientists	212,400	116,300	55,500	7,900	18,000	700	5,200	4,400	700	3,700
Men	197,400	108,400	51,500	7,000	16,900	700	4,600	4,100	600	3,500
Women	15,000	7,900	4,000	900	1,100	(1)	600	300	100	200
Mathematical scientists	88,400	34,200	35,100	3,100	9,400	800	3,300	1,500	(1)	1,000
Men	70,900	25,600	28,600	2,600	8,800	700	2,300	1,300	(1)	900
Women	17,500	8,600	6,500	500	600	(1)	1,000	200	(1)	100
Computer specialists	233,900	173,000	17,900	11,100	14,600	2,900	6,800	3,700	1,100	3,200
Men	193,400	145,100	13,900	9,000	12,300	2,700	4,100	3,500	800	2,200
Women	40,600	27,800	4,000	2,000	2,300	200	2,700	300	300	1,000
Environmental scientists	72,300	40,400	12,900	1,100	10,400	100	4,900	1,800	100	600
Men	64,600	36,000	11,300	1,000	9,500	100	4,400	1,700	100	600
Women	7,700	4,400	1,600	100	900	(1)	500	100	(1)	(1)
Engineers	1,268,400	985,400	48,700	17,900	90,600	11,600	52,900	34,700	3,000	23,600
Men	1,248,500	969,100	47,700	17,800	89,200	11,600	52,600	34,300	3,000	23,200
Women	19,800	16,300	900	100	1,400	(1)	300	400	(1)	400
Life scientists	291,000	86,400	94,400	18,500	41,800	1,800	31,400	4,200	8,700	3,600
Men	227,800	77,300	65,500	9,700	35,500	1,800	27,700	3,500	3,900	3,000
Women	63,200	9,100	28,900	8,900	6,400	(1)	3,800	700	4,800	600
Psychologists	120,900	31,600	55,300	10,200	4,000	2,200	13,200	1,700	2,000	700
Men	89,700	28,500	36,000	7,800	3,100	2,200	8,700	1,400	1,400	600
Women	31,200	3,000	19,400	2,400	900	(1)	4,500	300	600	100
Social scientists	186,000	60,800	61,300	10,200	17,000	500	27,600	6,200	1,000	1,200
Men	149,500	55,300	50,200	5,600	12,000	500	18,000	5,700	1,000	1,100
Women	36,500	5,600	11,100	4,600	5,000	(1)	9,600	500	100	100

[1] Too few cases to estimate.

NOTE: Detail may not add to total because of rounding.

SOURCE: National Science Foundation.

BEST DOCUMENT AVAILABLE

Table B-5. Scientists and engineers by field, sex, and primary work activity: 1974, 1976, and 1978

Field	Total			Research			Development			Management[1]			Teaching			Other[2]		
	1974	1976	1978	1974	1976	1978	1974	1976	1978	1974	1976	1978	1974	1976	1978	1974	1976	1978
Total, all fields	2,248,200	2,377,200	2,473,200	210,400	231,700	278,000	380,500	396,400	407,300	544,800	573,400	623,100	223,700	237,100	225,200	888,900	938,700	940,000
Men	2,072,100	2,179,900	2,241,700	180,500	197,600	230,600	371,500	386,100	393,500	520,500	546,600	596,000	188,800	202,300	179,900	811,000	847,600	841,700
Women	176,100	197,200	231,500	29,800	34,100	47,300	9,000	10,100	13,800	24,300	26,800	26,900	34,800	34,800	45,200	78,000	91,300	98,300
Physical scientists	201,400	227,400	212,400	54,400	62,700	66,500	24,500	27,600	28,000	31,200	36,200	45,600	29,300	32,900	25,800	61,500	67,900	46,500
Men	185,500	207,500	197,400	48,900	55,400	59,700	22,900	25,900	26,400	30,500	35,000	44,200	27,100	31,000	24,400	55,300	60,200	42,600
Women	15,900	19,900	15,000	5,500	7,400	6,800	1,600	1,800	1,600	700	1,200	1,300	1,900	1,900	1,400	6,200	7,700	3,900
Mathematical scientists	82,800	88,300	88,400	4,800	5,500	12,700	6,200	6,700	3,600	11,400	12,400	15,400	25,000	28,200	29,300	35,400	35,500	27,600
Men	69,300	72,700	70,900	4,400	5,000	10,400	6,000	6,300	3,600	9,200	9,800	14,600	20,900	23,600	25,600	28,800	28,000	16,800
Women	13,500	15,600	17,500	400	500	2,300	200	400	[3]	2,200	2,600	800	4,100	4,700	3,700	6,600	7,500	10,800
Computer specialists	166,200	172,300	233,900	2,300	2,300	5,700	20,900	21,300	28,200	27,300	27,900	34,300	2,600	2,700	6,700	113,100	118,200	159,000
Men	134,900	138,700	193,400	1,900	2,000	5,300	17,300	17,500	23,700	23,600	24,000	31,700	2,200	2,300	5,600	89,900	92,900	127,100
Women	31,300	33,600	46,600	400	400	600	3,800	3,700	4,400	3,700	3,800	2,600	400	400	1,100	23,200	25,400	31,900
Environmental scientists	69,100	74,800	72,300	14,900	15,900	20,600	2,700	2,800	5,500	12,100	13,500	11,600	6,500	6,500	6,300	33,000	36,200	28,400
Men	64,800	71,100	64,600	13,300	14,700	17,700	2,500	2,700	5,300	11,900	13,200	11,200	6,000	6,100	5,900	31,100	34,400	24,400
Women	4,300	3,700	7,700	1,500	1,300	2,800	200	100	200	200	200	400	400	300	400	2,000	1,800	3,900
Engineers	1,212,600	1,240,700	1,268,400	48,300	49,500	50,300	319,900	328,100	327,800	362,600	369,800	372,600	31,300	31,800	25,100	450,500	461,600	492,700
Men	1,208,300	1,234,000	1,248,500	47,900	48,800	48,300	318,200	325,900	323,700	361,900	369,000	370,600	31,300	31,800	25,000	449,000	458,700	481,100
Women	4,300	6,700	19,800	400	600	2,000	1,700	2,200	4,200	700	800	2,000	[3]	[3]	100	1,400	2,800	11,600
Life scientists	238,600	277,500	291,000	59,400	67,600	89,400	2,400	4,800	9,300	39,300	49,100	69,800	42,700	46,600	56,100	94,800	110,000	66,500
Men	193,400	226,000	227,800	43,400	49,500	63,900	2,000	4,200	6,800	33,700	42,700	61,600	32,700	37,000	37,500	81,700	92,800	57,900
Women	45,200	51,400	63,200	16,000	17,600	25,300	400	600	2,500	5,600	6,400	8,300	10,000	9,700	18,500	13,100	17,200	8,500
Psychologists	89,600	97,800	120,900	8,300	9,200	11,400	[3]	400	500	13,400	14,700	20,500	22,400	23,500	29,100	45,500	50,000	59,400
Men	71,500	76,700	89,700	6,300	6,800	8,200	[3]	300	300	11,200	12,200	16,000	18,300	19,400	17,600	35,700	38,000	47,600
Women	18,100	21,100	31,200	2,000	2,400	3,200	[3]	100	200	2,200	2,500	4,400	4,100	4,100	11,500	9,800	12,000	11,800
Social scientists	187,900	198,300	186,000	18,000	19,400	21,600	3,900	4,700	4,400	47,500	50,000	53,300	62,700	64,900	46,900	55,800	59,300	60,000
Men	144,400	153,200	149,500	14,400	15,400	17,200	2,600	3,400	3,700	38,500	40,700	46,000	49,500	51,300	38,300	39,500	42,200	44,300
Women	43,500	45,200	36,500	3,600	4,000	4,400	1,300	1,300	700	9,000	9,300	7,300	13,200	13,600	8,600	16,300	17,000	15,400

[1]Includes management of R&D.

[2]Includes consulting; production/inspection; reporting, statistical work, computing; other activities and no report.

[3]Too few cases to estimate.

NOTE: Detail may not add to total because of rounding.

SOURCE: National Science Foundation

BEST DOCUMENT AVAILABLE

Table B–6. Scientists and engineers by field, sex, and primary work activity: 1978

Field	Research and development				Management			Teaching	Consulting	Production/ inspection	Reporting, statis. work, computing	Other activities	No report
	Total	Basic research	Applied research	Development	Total	Of R&D	Other R&D						
Total, all fields	685,300	132,400	145,600	407,300	623,000	228,200	394,800	225,200	122,800	353,200	307,000	118,600	38,400
Men	624,100	104,900	125,800	393,500	596,000	218,400	377,700	179,900	113,800	338,400	247,500	107,500	34,500
Women	61,100	27,500	19,800	13,800	269,000	9,800	17,100	45,200	8,900	14,900	59,500	11,100	3,900
Physical scientists	94,500	32,500	33,900	28,000	45,600	28,600	16,900	25,800	3,900	27,600	7,900	3,500	3,600
Men	86,100	28,300	31,400	26,400	44,300	28,000	16,300	24,400	3,300	25,500	7,100	3,200	3,500
Women	8,400	4,300	2,500	1,600	1,300	600	600	1,400	600	2,100	800	300	100
Mathematical scientists	16,300	7,300	5,400	3,600	15,400	6,800	8,600	29,300	1,800	2,600	20,900	1,100	1,200
Men	14,000	7,200	3,200	3,600	14,600	6,500	8,100	25,600	1,700	2,600	10,300	1,100	1,100
Women	2,300	100	2,200	(1)	800	300	500	3,700	(1)	(1)	10,600	(1)	200
Computer specialists	33,900	1,000	4,700	28,200	34,300	14,300	20,000	6,700	11,500	9,200	128,400	5,900	4,000
Men	29,000	1,000	4,300	23,700	31,700	13,200	18,500	5,600	9,800	8,500	101,700	4,700	2,400
Women	5,000	100	500	4,400	2,600	1,100	1,500	1,100	1,700	700	26,700	1,200	1,600
Environmental scientists	26,000	7,500	13,100	5,500	11,600	4,500	7,100	6,300	3,800	8,400	10,700	4,200	1,300
Men	23,100	6,800	10,900	5,300	11,200	4,200	7,100	5,900	3,800	7,000	8,400	4,100	1,100
Women	3,000	700	2,100	200	400	300	(1)	400	(1)	1,400	2,200	100	200
Engineers	378,100	8,500	41,800	327,800	372,600	125,200	247,400	25,100	67,500	257,300	94,400	52,000	21,500
Men	372,000	8,200	40,100	323,700	370,600	123,800	246,800	25,000	67,000	252,000	89,700	51,000	21,400
Women	6,200	300	1,700	4,200	2,000	1,300	600	100	500	5,000	4,700	1,000	100
Life scientists	98,600	59,500	29,900	9,300	69,800	22,500	47,300	56,100	7,700	33,400	9,100	13,000	3,300
Men	70,700	40,100	23,800	6,800	61,600	19,300	42,300	37,500	6,800	30,700	6,800	11,000	2,600
Women	27,900	19,300	6,000	2,500	8,300	3,200	5,100	18,500	900	2,600	2,400	2,000	600
Psychologists	11,900	4,000	7,400	500	20,500	7,800	12,600	29,100	18,100	6,000	10,200	24,100	1,000
Men	8,500	2,500	5,700	300	16,000	6,200	9,800	17,600	14,300	4,400	6,800	21,300	800
Women	3,400	1,500	1,700	200	4,400	1,600	2,800	11,500	3,900	1,500	3,400	2,800	200
Social scientists	26,000	12,100	9,400	4,400	53,300	18,500	34,900	46,900	8,500	8,800	25,400	14,800	2,500
Men	20,900	10,800	6,400	3,700	46,000	17,200	28,800	38,300	7,100	7,800	16,700	11,100	1,600
Women	5,100	1,400	3,000	700	7,300	1,300	6,100	8,600	1,300	1,000	8,600	3,600	900

[1]Too few cases to estimate.

NOTE: Detail may not add to total because of rounding.

SOURCE: National Science Foundation.

BEST DOCUMENT AVAILABLE

Table B–7. Salaries and annual growth rates for professional, technical, and kindred workers and scientists and engineers: 1974–78

Year	Professional, technical and kindred workers		Scientists and engineers	
	Salaries	Percent growth	Salaries	Percent growth
1974	$22,800	—	$19,300	—
1975	24,600	7.9	—	9.2
1976	25,600	4.1	23,000	9.2
1977	27,700	8.2	—	8.7
1978	29,400	6.1	27,200	8.7

NOTE: Annual rates of growth are not adjusted for inflation.
SOURCE: National Science Foundation and Department of Labor.

Table B–8. Median annual salaries of 1972 science/engineering degree recipients by field and level of highest degree: 1978

Field	Bachelor's	Master's	Doctorate
Total	$18,200	$19,600	$19,500
Physical sciences	16,200	17,700	20,500
Mathematical sciences	16,700	20,400	(1)
Engineering	20,400	21,200	(1)
Life sciences	15,100	15,100	(1)
Social sciences	14,900	16,100	18,400

[1] Too few cases to estimate.
SOURCE: National Science Foundation.

Table B–9. Median annual salaries of experienced scientists and engineers by sex and race: 1974, 1976, and 1978

Field	1974	1976	1978
Total	$19,300	$23,000	$27,200
Sex:			
Men	19,400	23,100	27,400
Women	15,700	19,000	22,600
Race:			
White	19,400	23,000	27,300
Black	18,200	21,700	24,900
Asian	NA	22,300	25,800
Other	NA	19,800	24,300

NA: Not available
SOURCE: National Science Foundation.

Table B–10. Median annual salaries of experienced scientists and engineers by sex, race, and field: 1978

Sex and race	All fields	Physical scientists	Mathematical scientists	Computer specialists	Environmental scientists	Life scientists	Psychologists	Social scientists	Engineers
Total	$27,200	$27,600	$27,500	$25,900	$30,400	$24,900	$26,500	$27,600	$27,400
Sex:									
Men	27,400	28,000	27,900	26,200	30,500	25,200	27,300	28,700	27,400
Women	22,600	22,000	24,100	23,600	24,700	21,900	23,800	21,000	24,100
Race:									
White	27,300	27,800	27,700	25,900	30,400	25,000	26,500	27,700	27,500
Black	24,900	23,400	26,600	25,600	(1)	22,200	28,500	22,000	28,800
Asian	25,800	26,300	26,800	25,100	(1)	22,800	(1)	(1)	25,600
Other	24,300	(1)	(1)	(1)	(1)	21,700	(1)	(1)	24,700

[1] Too few cases to estimate
SOURCE: National Science Foundation.

Table B–11. Unemployment rates: 1976–78

Year	Scientists and engineers	Professional, technical, and kindred workers	Total labor force
1976	3.0	3.2	7.7
1977	2.1	3.0	7.0
1978	1.4	2.5	6.0

SOURCE: Bureau of Labor Statistics.

BEST DOCUMENT AVAILABLE

Table B–12. GNP real growth and engineer unemployment rate (lagged one year): 1965–78

Year	Gross national product (billions of dollars)	GNP growth rate (in constant 1972 dollars) (percent change)	Unemployment rate
1964	$ 874.4	5.9	1.1
1965	925.9	6.0	.7
1966	981.0	2.7	.6
1967	1,007.7	4.4	.7
1968	1,051.8	2.6	.8
1969	1,078.8	–.3	2.2
1970	1,075.3	3.0	2.9
1971	1,107.5		
1972	1,171.1	5.7	2.0
1973	1,235.0	5.5	1.0
1974	1,217.8	–1.4	1.3
1975	1,202.3	–1.3	2.6
1976	1,271.0	5.7	2.1
1977	1,332.7	4.9	1.4
1978	1,386.6	4.0	1.2

SOURCE: Executive Office of the President and Bureau of Labor Statistics.

Table B-13. Scientists and engineers by field, employment status, and race: 1974, 1976, and 1978

Field	Total					Total labor force					Outside labor force				
	Total	White	Black	Asian	Other[1]	Total	White	Black	Asian	Other[1]	Total	White	Black	Asian	Other[1]
	1974														
Total, all fields	2,481,800	2,375,600	38,500	43,900	23,800	2,288,000	2,188,500	35,500	41,200	22,800	193,800	187,100	3,000	2,700	1,000
Physical scientists	247,900	235,400	4,100	6,200	2,100	206,500	195,000	4,100	6,000	1,400	41,400	40,400	(2)	200	800
Mathematical scientists	101,000	96,700	2,500	1,500	400	84,500	80,600	2,200	1,300	400	16,500	16,100	300	200	(2)
Computer specialists	170,000	162,500	3,300	3,500	700	167,100	160,000	3,000	3,400	700	2,900	2,500	300	100	(2)
Environmental scientists	79,000	77,300	200	700	700	71,500	70,000	200	700	600	7,500	7,300	(2)	(2)	100
Engineers	1,291,600	1,246,700	11,800	22,300	10,800	1,228,600	1,184,900	10,900	22,000	10,800	63,000	61,800	900	300	(2)
Life scientists	266,000	255,700	3,200	3,700	3,400	243,400	233,900	2,700	3,400	3,400	22,600	21,800	500	300	(2)
Psychologists	109,300	103,500	1,800	3,000	1,000	94,000	88,800	1,700	2,500	1,000	15,300	14,700	100	500	(2)
Social scientists	217,000	197,800	11,600	3,000	4,600	192,400	175,400	10,700	1,900	4,400	24,600	22,400	900	1,100	200
	1976														
Total, all fields	2,705,800	2,593,600	40,400	45,400	26,400	2,451,700	2,348,200	36,000	42,600	24,800	254,100	245,400	4,400	2,800	1,600
Physical scientists	280,600	266,300	4,400	5,900	4,000	237,200	224,800	3,400	5,600	3,600	43,300	41,500	1,000	300	500
Mathematical scientists	110,200	105,300	2,700	1,600	500	92,200	88,000	2,400	1,200	500	18,000	17,300	300	400	(2)
Computer specialists	179,900	171,800	3,700	3,700	800	173,500	165,400	3,700	3,600	800	6,400	6,400	(2)	(2)	(2)
Environmental scientists	85,700	84,600	100	500	500	77,400	76,300	100	500	500	8,300	8,300	(2)	(2)	(2)
Engineers	1,375,200	1,327,300	12,600	23,000	12,400	1,268,000	1,222,400	12,200	21,400	12,100	107,200	104,900	400	1,600	300
Life scientists	314,100	302,100	3,600	4,100	4,200	286,300	275,600	3,000	3,900	3,800	27,800	26,500	600	300	400
Psychologists	122,900	116,900	1,600	3,300	1,100	105,700	100,100	1,500	3,200	1,100	17,200	16,800	200	100	100
Social scientists	237,200	219,400	11,600	3,400	2,800	211,400	195,700	9,800	3,300	2,600	25,600	23,700	1,800	100	100
	1978														
Total, all fields	2,741,400	2,621,200	41,800	53,700	24,700	2,507,600	2,393,000	39,600	51,300	23,200	233,800	227,600	2,200	2,500	1,500
Physical scientists	254,600	243,300	3,700	5,700	1,900	216,700	206,800	3,200	5,300	1,400	37,900	36,500	500	400	500
Mathematical scientists	107,800	101,300	3,000	2,000	1,400	89,800	83,900	2,900	1,800	1,200	18,000	17,400	100	100	200
Computer specialists	237,500	229,100	1,400	6,900	100	234,600	226,300	1,300	6,900	100	2,900	2,800	100	100	(2)
Environmental scientists	80,800	78,900	700	600	500	73,900	72,200	700	600	500	6,900	6,700	(2)	100	100
Engineers	1,396,400	1,344,000	11,400	27,000	13,900	1,285,000	1,234,400	10,600	26,400	13,600	111,300	109,600	800	700	300
Life scientists	327,600	313,100	6,700	5,900	1,900	295,800	282,400	6,600	5,200	1,600	31,800	30,700	100	700	200
Psychologists	131,700	127,000	3,700	100	800	123,200	119,000	3,500	(2)	700	8,500	8,000	300	200	(2)
Social scientists	205,100	184,600	11,000	5,400	4,000	188,500	168,700	10,700	5,100	4,000	16,600	15,900	300	300	100

[1]Includes American Indians, other, and no report.
[2]Too few cases to estimate.
NOTE: Detail may not add to total because of rounding.
SOURCE: National Science Foundation

BEST DOCUMENT AVAILABLE

Table B–14. Scientists and engineers by field, labor force status, and race: 1974, 1976, and 1978

Field	Total employed					Unemployed but seeking employment				
	Total	White	Black	Asian	Other[1]	Total	White	Black	Asian	Other[1]
	1974									
Total, all fields	2,248,200	2,152,900	32,500	40,500	22,500	39,800	35,600	3,000	700	300
Physical scientists	201,400	190,100	4,000	5,900	1,400	5,100	4,900	100	100	(2)
Mathematical scientists	82,800	79,300	1,800	1,300	400	1,700	1,300	400	(2)	(2)
Computer specialists	166,200	159,300	2,800	3,400	700	900	700	200	(2)	(2)
Enviromental scientists	69,100	67,700	200	700	600	2,400	2,300	(2)	(2)	(2)
Engineers	1,212,600	1,169,800	10,400	21,800	10,800	16,000	15,100	500	200	(2)
Life scientists	238,600	229,100	2,600	3,300	3,400	4,800	4,600	100	100	(2)
Psychologists	89,600	84,600	1,500	2,500	1,000	4,400	4,200	200	(2)	(2)
Social scientists	187,900	172,900	9,100	1,800	4,400	4,500	2,500	1,600	100	(2)
	1976									
Total, all fields	2,377,100	2,278,800	33,000	41,400	23,800	74,600	69,400	3,000	1,200	1,000
Physical scientists	227,400	215,300	3,300	5,400	3,500	9,900	9,500	100	200	100
Mathematical scientists	88,300	84,900	2,000	1,100	200	3,900	3,100	400	100	300
Computer specialists	172,400	164,400	3,500	3,600	800	1,100	1,000	200	(2)	(2)
Enviromental scientists	74,800	73,700	100	500	500	2,600	2,600	(2)	(2)	(2)
Engineers	1,240,800	1,196,800	11,700	20,600	11,800	27,200	25,600	500	800	300
Life scientists	277,500	267,000	2,900	3,900	3,700	8,800	8,600	100	(2)	100
Psychologists	97,700	92,400	1,300	3,100	1,000	8,000	7,700	200	100	(2)
Social scientists	198,300	184,300	8,200	3,300	2,500	13,100	11,400	1,600	(2)	100
	1978									
Total, all fields	2,473,200	2,360,300	39,000	50,500	22,800	34,400	32,700	600	800	400
Physical scientists	212,400	202,500	3,100	5,300	1,300	4,300	4,200	100	(2)	100
Mathematical scientists	88,400	82,600	2,900	1,800	1,200	1,400	1,300	(2)	(2)	(2)
Computer specialists	233,900	225,800	1,100	6,900	100	600	500	200	(2)	(2)
Enviromental scientists	72,200	70,600	700	600	400	1,700	1,600	(2)	(2)	100
Engineers	1,268,400	1,217,900	10,600	26,400	13,500	16,600	16,500	(2)	(2)	100
Life scientists	291,000	278,200	6,600	4,600	1,400	4,900	4,200	(2)	600	200
Psychologists	120,900	117,000	3,300	(2)	700	2,300	2,000	200	(2)	(2)
Social scientists	186,000	166,300	10,600	5,100	4,000	2,500	2,400	100	(2)	(2)

[1]Other and no report.

[2]Too few cases to estimate.

NOTE: Detail may not add to total because of rounding.

SOURCE: National Science Foundation.

BEST DOCUMENT AVAILABLE

Table B-15. Characteristics of the total population of doctoral scientists and engineers in the U.S.

Characteristics	1973		1975		1977	
	Number	Percent	Number	Percent	Number	Percent
Total	238,913	100.0	270,480	100.0	303,267	100.0
Field:						
Physical scientists	53,008	22.2	58,445	21.6	62,055	20.5
Chemists	33,920	14.2	38,422	14.2	40,650	13.4
Physicists/astronomers	19,088	8.0	20,023	7.4	21,405	7.1
Mathematical scientists	13,084	5.5	14,236	5.3	15,406	5.1
Mathematicians	11,581	4.8	12,474	4.6	13,665	4.5
Statisticians	1,503	.6	1,762	.7	1,741	.6
Computer specialists	2,726	1.1	3,498	1.3	5,822	1.9
Environmental scientists	10,930	4.6	12,478	4.6	13,543	4.5
Earth scientists	9,078	3.8	9,836	3.6	10,235	3.4
Oceanographers	1,196	.5	1,311	.5	1,592	.5
Atmospheric scientists	656	.3	1,331	.5	1,716	.6
Engineers	37,261	15.6	43,449	16.1	46,539	15.3
Life scientists	63,583	26.6	70,256	26.0	78,335	25.8
Biological scientists	40,673	17.0	42,741	15.8	46,788	15.4
Agricultural scientists	11,408	4.8	13,519	5.0	15,062	5.0
Medical scientists	11,502	4.8	13,996	5.2	16,485	5.4
Psychologists	27,151	11.4	31,358	11.6	35,718	11.8
Social scientists	31,170	13.0	36,760	13.6	45,849	15.1
Economists	9,316	3.9	10,650	3.9	11,689	3.9
Sociologists/anthropologists	7,219	3.0	8,521	3.2	10,352	3.4
Other social scientists	14,635	6.1	17,589	6.5	23,808	7.9
Sex:						
Men	218,040	91.3	244,909	90.5	271,594	89.6
Women	20,873	8.7	25,571	9.5	31,673	10.4
Race:						
White	216,867	90.8	241,915	89.4	270,305	89.1
Black	2,188	.9	2,596	1.0	2,846	.9
American Indian	375	.2	450	.2	630	.2
Asian	9,449	4.0	12,931	4.8	15,703	5.2
No report	10,034	4.2	12,588	4.7	13,783	4.5
Age:						
Under 30	10,145	4.2	9,831	3.6	8,863	2.9
30-34	52,102	21.8	56,930	21.0	55,461	18.3
35-39	43,611	18.3	54,551	20.2	68,762	22.7
40-44	36,746	15.4	40,665	15.0	46,284	15.3
45-49	31,257	13.1	34,288	12.7	38,671	12.8
50-54	25,312	10.6	29,362	10.9	31,953	10.5
55-59	16,787	7.0	19,162	7.1	23,816	7.9
60-64	10,479	4.4	12,552	4.6	14,838	4.9
65 & over	12,036	5.0	12,710	4.7	14,129	4.7
No report	438	.2	429	.2	490	.2
Employment Status:						
Full-time employed	208,447	87.2	240,566	88.9	266,998	88.0
Science/engineering	197,059	82.5	227,735	84.2	245,208	80.9
Nonscience/engineering	11,388	4.8	12,831	4.7	21,790	7.2
Part-time employed	6,287	2.6	7,327	2.7	7,484	2.5
Science/engineering	5,549	2.3	6,406	2.4	6,349	2.1
Nonscience/engineering	738	.3	921	.3	1,135	.4
Postdoctorates	5,678	2.4	8,155	3.0	9,755	3.2
Unemployed/seeking	2,514	1.1	2,477	.9	3,312	1.1
Not employed/not seeking	1,454	.6	2,374	.9	2,830	.9
Retired/not employed	6,962	2.9	8,652	3.2	9,748	3.2
Other	2,305	1.0	440	.2	540	.2
No report	5,268	2.2	489	.2	2,600	.9

NOTE: Percents may not add to 100 because of rounding.
SOURCE: National Science Foundation.

BEST DOCUMENT AVAILABLE

Table B-16. Selected characteristics of employed doctoral scientists and engineers in the U.S.

Characteristics	1973			1975			1977		
	Number	Percent	Median annual salary	Number	Percent	Median annual salary	Number	Percent	Median annual salary
Total	220,410	100.00	$20,700	256,048	100.00	$23,200	284,237	100.0	$25,600
Field:									
Physical scientists	48,486	22.0	21,000	54,638	21.3	23,900	57,450	20.2	26,800
Chemists	30,704	13.9	21,000	35,812	14.0	24,000	37,314	13.1	26,800
Physicists/astronomers	17,782	8.1	21,000	18,826	7.4	23,700	20,136	7.1	26,500
Mathematical scientists	12,145	5.5	19,200	13,639	5.3	21,200	14,573	5.1	23,300
Mathematicians	10,686	4.8	19,000	11,898	4.6	20,900	12,860	4.5	23,100
Statisticians	1,459	.7	20,900	1,741	.7	23,100	1,713	.6	25,100
Computer specialists	2,882	1.2	21,700	3,496	1.4	23,500	5,787	2.0	25,800
Environmental scientists	10,329	4.7	20,700	12,126	4.7	23,500	13,026	4.6	25,800
Earth scientists	8,534	3.9	20,700	9,531	3.7	23,600	9,785	3.4	25,900
Oceanographers	1,157	.5	19,800	1,277	.5	22,200	1,563	.5	24,100
Atmospheric scientists	638	.3	22,500	1,318	.5	24,200	1,698	.6	28,300
Engineers	35,775	16.2	22,300	42,410	16.6	25,200	45,046	15.8	28,600
Life scientists	58,047	26.3	20,100	65,184	25.5	22,300	71,924	25.3	24,700
Biological scientists	36,859	16.7	19,400	39,076	15.3	21,300	42,161	14.8	23,800
Agricultural scientists	10,553	4.8	19,900	12,924	5.0	22,100	14,293	5.0	24,800
Medical scientists	10,635	4.8	22,700	13,184	5.1	25,700	15,470	5.4	28,000
Psychologists	24,850	11.3	20,200	30,073	11.7	22,100	33,724	11.9	24,100
Social scientists	28,106	12.8	20,300	34,482	13.5	22,100	42,727	15.0	24,100
Economists	8,289	3.8	22,300	9,888	3.9	24,500	10,790	3.8	27,000
Sociologists/anthropologists	6,530	3.0	19,300	7,930	3.1	20,700	9,493	3.3	22,200
Other social scientists	13,287	6.0	19,500	16,664	6.5	21,100	22,444	7.9	23,200
Sex:									
Men	203,452	92.3	21,000	233,935	91.4	23,500	256,735	90.3	26,000
Women	16,958	7.7	17,400	22,113	8.6	19,000	27,502	9.7	20,700
Race:									
White	200,691	91.1	21,000	229,322	89.6	23,200	253,309	89.1	25,700
Black	2,034	.9	21,200	2,474	1.0	22,800	2,744	1.0	23,800
Am. Indian	340	.2	(*)	435	.2	20,800	587	.2	23,900
Asian	8,989	4.1	20,000	12,577	4.9	21,500	15,242	5.4	23,800
No report	8,356	3.8	20,800	11,240	4.4	23,100	12,345	4.3	25,700
Age:									
Under 30	9,689	4.4	15,400	9,528	3.7	18,900	8,474	3.0	18,500
30-34	49,726	22.6	17,300	55,217	21.6	18,800	53,562	18.8	20,400
35-39	42,064	19.1	19,800	53,516	20.9	21,500	66,741	23.5	23,600
40-44	35,304	16.0	21,800	40,044	15.6	24,200	45,147	15.9	26,500
45-49	29,945	13.6	24,100	33,640	13.1	26,200	37,626	13.2	29,200
50-54	24,109	10.9	24,900	28,675	11.2	28,100	30,935	10.9	30,900
55-59	15,579	7.1	25,200	18,435	7.2	28,200	22,507	7.9	31,600
60-64	8,982	4.1	25,500	11,255	4.4	28,500	12,944	4.6	31,400
65 & over	4,876	2.2	24,700	5,476	2.1	(*)	5,974	2.1	31,200
No report	156	.1	24,300	262	.1	24,200	327	.1	26,800
Sector of employment:									
Business & industry	53,403	24.2	23,300	64,630	25.2	26,000	71,464	25.1	29,900
Educational institutions	129,408	58.7	19,100	149,184	58.3	21,400	163,101	57.4	23,700
4-year coll./univ.	124,901	56.7	19,200	143,701	56.1	21,500	156,452	55.0	23,800
2-year college	2,962	1.3	17,800	3,567	1.4	19,100	4,634	1.6	20,900
Elem./sec. school	1,545	.7	19,300	1,916	.7	20,500	2,015	.7	22,400
Hospital/clinic	4,543	2.1	19,400	7,469	2.9	21,800	8,587	3.0	23,600
Nonprofit organizations	8,006	3.6	21,700	8,337	3.3	24,400	10,188	3.6	26,800
Federal Government	18,200	8.3	23,500	18,995	7.4	26,300	21,353	7.5	29,700
Military/Commissioned Corps	1,977	.9	(*)	2,130	.8	(*)	2,282	.8	(*)
State government	3,001	1.4	19,500	3,015	1.2	20,900	3,783	1.3	21,800
Other government	1,255	.6	19,000	1,880	.7	22,900	1,545	.5	22,100
Other	331	.2	21,100	82	(*)	(*)	584	.2	37,500
No report	288	.1	(*)	326	.1	(*)	1,350	.5	(*)
Primary work activity:									
Research and development	71,460	32.4	20,800	82,360	32.2	23,000	93,480	32.9	25,600
Basic research	34,258	15.5	19,900	38,144	14.9	22,200	43,545	15.3	24,600
Applied research	28,700	13.0	21,000	32,885	12.8	23,300	36,413	12.8	26,300
Development	8,502	3.9	21,100	11,331	4.4	23,600	13,502	4.8	26,100
Management or administration	46,172	20.9	26,700	51,778	20.2	29,500	60,484	21.3	31,900
Of R&D	26,223	11.9	27,000	28,669	11.2	30,100	30,733	10.8	33,100
Other than R&D	13,258	6.0	25,700	15,720	6.1	27,800	22,150	7.8	30,200
Of both	6,691	3.0	27,500	7,389	2.9	30,200	7,581	2.7	32,200
Teaching	80,012	36.3	18,900	91,159	35.6	20,600	90,392	31.8	22,600
Consulting	4,055	1.8	23,200	5,516	2.2	25,400	6,141	2.2	28,200
Sales/professional services	8,084	3.7	20,700	11,872	4.6	21,900	15,183	5.3	24,700
Other	6,959	3.2	(*)	7,485	2.9	22,100	12,785	4.5	24,900
No report	3,688	1.7	21,400	6,078	2.4	23,700	5,812	2.0	25,400

*No median computed for groups with fewer than 30 individuals reporting salary
*Data not available.
*Less than .05 percent.

NOTE: Percents may not add to 100 because of rounding. Median salaries computed for full-time employed civilians only.
SOURCE: National Science Foundation.

BEST DOCUMENT AVAILABLE

Table B–17. Selected characteristics of doctoral scientists and engineers by labor force participation and unemployment rates

Selected characteristics	1973			1975			1977		
	Labor force	Participation rate	Unemployment rate	Labor force	Participation rate	Unemployment rate	Labor force	Participation rate	Unemployment rate
Total, all fields	222,900	93.1	1.1	258,600	95.6	1.0	287,500	94.8	1.2
Physical scientists	49,300	93.1	1.8	55,400	94.8	1.4	58,200	93.8	1.3
Mathematical scientists	12,300	94.1	1.4	13,900	97.6	1.0	14,700	95.7	1.2
Computer specialists	2,700	98.8	(1)	3,500	99.9	(1)	5,800	99.1	(1)
Enviromental scientists	10,400	95.5	1.0	12,200	97.8	.7	13,100	96.9	.7
Engineers	36,000	96.7	.7	42,500	97.8	.7	45,300	97.4	.6
Life scientists	58,600	92.2	1.0	65,900	93.7	1.0	72,900	93.1	1.4
Psychologists	25,100	92.5	1.0	30,300	96.6	.7	34,100	95.6	1.2
Social scientists	28,400	91.1	1.0	34,800	94.7	1.0	43,300	94.5	1.4
Sex:									
Men	205,300	94.2	.9	235,800	96.3	.8	259,100	95.4	.9
Women	17,600	84.4	3.8	228,000	89.2	3.0	28,500	89.9	3.4
Race:									
White	202,900	93.6	1.1	231,500	95.7	.9	256,200	94.8	1.1
Racial minorities	11,500	96.1	1.6	15,700	98.3	1.5	18,900	98.3	1.5
Black	2,000	93.0	(1)	2,500	96.3	1.0	2,800	97.0	.7
American Indian	400	94.4	4.0	400	88.9	2.9	600	98.3	3.6
Asian	9,200	96.9	1.8	12,800	95.9	1.6	15,500	98.6	1.5
No report	8,500	(1)	(1)	11,300	(1)	(1)	12,500	(1)	(1)

[1]Too few cases to estimate.
NOTE: Detail may not add to totals because of rounding.
SOURCE: National Science Foundation.

Table B-18. Employed doctoral scientists and engineers by field and type of employer: 1973, 1975, and 1977

Field	Educational institutions			Business and industry			Federal Government		
	1973	1975	1977	1973	1975	1977	1973	1975	1977
Total, all fields	129,400	149,200	163,100	53,400	64,600	71,500	18,200	19,000	21,400
Physical scientists	22,000	25,700	27,100	19,700	22,100	23,000	4,100	3,700	3,900
Mathematical scientists	10,500	11,700	12,200	900	1,100	1,300	500	600	600
Computer specialists	1,400	1,700	2,100	1,000	1,400	3,100	100	200	300
Environmental scientists	5,200	6,000	6,300	2,200	2,900	3,100	2,000	2,200	2,400
Engineers	13,000	14,900	15,900	17,800	22,100	22,900	2,700	3,000	3,500
Life scientists	39,200	43,800	47,500	7,200	8,800	10,100	6,100	6,300	6,800
Psychologists	15,100	17,700	18,600	3,100	4,100	5,500	1,200	1,000	1,200
Social scientists	23,000	27,700	33,400	1,600	2,100	2,600	1,500	2,000	2,600
	Percent distribution								
Total, all fields	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Physical scientists	17.0	17.2	16.6	36.8	34.2	18.5	22.5	19.7	18.5
Mathematical scientists	8.1	7.9	7.5	1.6	1.6	2.8	2.7	2.9	2.8
Computer specialists	1.1	1.1	1.3	1.9	2.2	1.2	.7	1.0	1.2
Environmental scientists	4.0	4.0	3.9	4.1	4.5	11.5	10.8	11.6	11.5
Engineers	10.1	10.0	9.8	33.3	34.2	16.5	15.0	15.9	16.5
Life scientists	30.3	29.4	29.1	13.6	13.7	31.7	33.6	33.1	31.7
Psychologists	11.7	11.9	11.4	5.8	6.4	5.8	6.8	5.1	5.8
Social scientists	17.8	18.6	20.5	3.0	3.2	12.4	8.0	10.6	12.4

NOTE: Detail may not add to totals because of rounding.
SOURCE: National Science Foundation

BEST DOCUMENT AVAILABLE

Table B-19. Doctoral scientists and engineers by primary work activity, and type of employer: 1973, 1975, and 1977

Primary work activity	Educational institutions			Business and industry			Federal Government		
	1973	1975	1977	1973	1975	1977	1973	1975	1977
Total	129,400	149,200	163,100	53,400	64,600	71,500	18,200	19,000	21,400
Research and development	30,700	35,600	42,600	23,800	28,700	31,300	10,000	10,400	10,800
Basic research	22,500	25,300	30,000	3,500	4,300	4,600	4,700	4,700	4,700
Applied research	7,600	9,600	11,100	13,200	15,100	16,500	4,800	5,000	5,200
Development	600	700	1,500	7,000	9,400	10,200	500	700	900
Management/administration	13,600	15,500	20,000	19,800	22,700	23,900	6,200	6,100	7,700
Of R&D	4,500	5,100	6,100	14,200	15,700	15,900	4,500	4,700	5,400
Other than R&D	6,200	6,800	10,100	3,500	4,700	6,100	1,000	900	1,500
Of both	2,900	3,500	3,800	2,100	2,200	1,900	700	500	700
Teaching	78,900	90,300	89,300	200	200	200	200	100	200
Other[1]	6,100	7,800	11,200	9,600	13,000	15,900	1,700	2,300	2,700
	Percent distribution								
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Research and development	23.7	23.9	26.1	44.5	44.5	43.9	55.0	54.6	50.8
Basic research	17.4	17.0	18.4	6.6	6.6	6.5	26.0	24.6	22.1
Applied research	5.9	6.4	6.8	24.7	23.4	23.1	26.4	26.6	24.4
Development	.5	.5	.9	13.1	14.5	14.2	2.6	3.5	4.3
Management/administration	10.5	10.4	12.3	37.2	35.1	33.5	34.0	32.3	35.9
Of R&D	3.5	3.4	3.8	26.7	24.3	22.3	24.7	24.8	25.3
Other than R&D	4.8	4.6	6.2	6.5	7.3	8.6	5.7	4.6	7.2
Of both	2.2	2.3	2.3	4.0	3.5	2.6	3.6	2.8	3.4
Teaching	61.0	60.6	54.7	.4	.3	.3	1.4	.7	.7
Other[1]	4.7	5.3	6.8	18.0	20.2	22.3	9.6	12.3	12.6

[1] Includes consulting, sales/professional services, other, and no report.
NOTE: Detail may not add to totals because of rounding.
SOURCE: National Science Foundation

Table B–20. Percent of 1976 cohort of science/engineering doctorates primarily engaged in R&D activities by type of employer: 1977

Type of employer	Total employed	Research and development[1]	Percent
Total	16,258	7,829	48
Business and industry	2,968	2,030	68
Educational institutions	10,044	4,146	41
Federal Government	971	739	76
Other[2]	2,236	900	40

[1] Includes management of R&D.
[2] Includes hospitals clinics, nonprofit organizations, State government, other government, and other.
SOURCE: National Science Foundation, unpublished data.

BEST DOCUMENT AVAILABLE

Table B-21. Selected characteristics of employed women doctoral scientists and engineers in the U.S.

Characteristics	1973				1975				1977			
	Number	Percent	Percent of total employed	Median annual salary	Number	Percent	Percent of total employed	Median annual salary	Number	Percent	Percent of total employed	Median annual salary
Total	16,958	100.0	7.7	$17,400	22,113	100.0	8.6	$19,000	27,502	100.0	9.7	$20,700
Field:												
Physical scientists	1,897	11.2	3.9	17,400	2,521	11.4	4.6	19,100	2,908	10.6	5.1	21,200
Chemists	1,481	8.6	4.8	17,300	2,048	9.3	5.7	19,000	2,354	8.6	6.3	20,900
Physicists/astronomers	436	2.6	2.5	17,700	475	2.1	2.5	19,300	554	2.0	2.8	23,100
Mathematical scientists	775	4.6	6.4	17,100	907	4.1	6.7	18,300	1,048	3.8	7.2	19,900
Mathematicians	701	4.1	6.6	16,800	822	3.7	6.9	18,100	934	3.4	7.3	19,900
Statisticians	74	.4	5.1	19,500	85	.4	4.9	22,100	114	.4	6.7	19,800
Computer specialists	88	.5	3.3	17,700	147	.7	4.2	18,000	233	.8	4.0	20,800
Environmental scientists	262	1.5	2.5	17,000	325	1.5	2.7	19,000	439	1.6	3.4	19,700
Earth scientists	205	1.2	2.4	16,700	242	1.1	2.5	18,200	293	1.1	3.0	20,000
Oceanographers	37	.2	3.2	(*)	51	.2	4.0	(*)	75	.3	4.8	19,200
Atmospheric scientists	20	.1	3.1	(*)	32	.1	2.4	(*)	71	.3	4.2	19,200
Engineers	139	.8	.4	19,600	235	1.1	.6	20,800	283	1.0	.6	22,900
Life scientists	6,120	36.1	10.5	17,300	7,534	34.1	11.6	18,900	8,983	32.7	12.5	21,000
Biological scientists	4,898	28.9	13.3	17,100	5,797	26.2	14.8	18,400	6,684	24.3	15.9	20,500
Agricultural scientists	131	.8	1.2	(*)	187	.8	1.3	20,000	264	1.0	1.8	20,200
Medical scientists	1,093	6.4	10.3	18,300	1,570	7.1	11.9	20,600	2,035	7.4	13.2	22,800
Psychologists	4,782	28.2	19.2	18,200	6,349	28.7	21.1	19,600	7,645	27.8	22.7	20,800
Social scientists	2,895	17.1	10.3	17,600	4,095	18.5	11.9	18,700	5,983	21.7	14.0	20,200
Economists	476	2.8	5.7	19,300	614	2.8	6.2	21,400	788	2.9	7.3	23,600
Sociologists/anthropologists	1,227	7.2	18.8	17,100	1,675	7.6	21.1	18,500	2,286	8.3	24.1	19,700
Other social scientists	1,192	7.0	9.0	17,400	1,806	8.2	10.8	18,200	2,889	10.5	12.9	19,800
Age:												
Under 30	1,026	6.1	10.6	14,400	1,534	6.9	16.1	15,900	1,640	6.0	19.4	17,400
30-34	3,546	20.9	7.1	14,900	4,970	22.5	9.0	16,800	6,621	24.1	12.4	18,400
35-39	2,767	16.3	6.6	16,600	4,082	18.5	7.6	18,300	5,641	20.5	8.5	20,000
40-44	2,445	14.4	6.9	17,900	2,810	12.7	7.0	19,900	3,479	12.6	7.7	21,700
45-49	2,488	14.7	8.3	18,700	2,917	13.2	8.7	21,300	3,291	12.0	8.7	23,100
50-54	1,845	10.9	7.7	19,500	2,407	10.9	8.4	22,300	2,867	10.5	9.3	24,700
55-59	1,379	8.1	8.9	20,200	1,487	6.6	8.0	21,600	1,876	6.8	8.3	24,200
60-64	847	5.0	9.4	20,500	1,180	5.2	10.3	22,700	1,233	4.5	9.5	25,000
65 & over	570	3.4	11.7	19,800	703	3.2	12.8	22,400	726	2.6	12.2	25,100
No report	45	.3	28.8	(*)	63	.3	24.0	(*)	108	.4	33.0	(*)
Sector of employment:												
Business & industry	1,363	8.0	2.8	19,700	2,141	9.7	3.3	22,200	2,959	10.8	4.1	24,400
Educational institutions	12,180	71.7	9.4	17,100	15,536	70.3	10.4	18,400	18,773	68.3	11.5	20,000
4-year coll./univ.	11,128	65.6	8.9	17,100	14,236	64.4	9.9	18,400	17,144	62.3	11.0	20,000
2-year college	549	3.2	18.5	17,000	701	3.2	19.7	18,700	927	3.4	20.0	19,700
Elem./sec. school	483	2.8	31.3	19,900	599	2.7	31.3	20,700	702	2.6	34.8	21,000
Hospital/clinic	967	5.7	21.3	17,500	1,745	7.9	23.4	19,400	1,958	7.1	22.8	21,000
Nonprofit organization	783	4.6	9.8	17,900	917	4.1	11.0	19,600	1,445	5.3	14.2	21,100
Federal Government	971	5.7	5.3	22,100	1,033	4.7	5.4	24,700	1,273	4.6	6.0	26,600
Military/Comm. Corps	19	.1	1.0	(*)	39	.2	1.8	(*)	47	.2	2.1	(*)
State government	388	2.3	12.9	19,000	393	1.8	13.0	19,700	495	1.8	13.1	19,500
Other government	188	1.1	15.0	17,300	235	1.1	12.5	19,900	345	1.3	22.3	21,700
Other	74	.4	22.4	19,700	15	.1	16.3	(*)	23	.1	3.9	(*)
No report	47	.3	16.4	18,500	59	.3	18.1	(*)	184	.7	13.6	(*)
Primary work activity:												
Research and development	4,654	27.4	6.5	17,400	5,998	27.1	7.3	19,100	7,594	27.6	8.1	21,000
Basic research	3,500	20.6	10.2	16,800	4,450	20.1	11.7	18,400	5,434	19.8	12.5	20,600
Applied research	1,004	5.9	3.5	19,100	1,323	6.0	4.0	20,400	1,755	6.4	4.8	22,200
Development	150	.9	1.8	17,200	225	1.0	2.0	19,500	405	1.5	3.0	20,500
Management or administration	1,837	10.8	4.0	22,300	2,441	11.0	4.7	22,900	3,438	12.5	5.7	25,100
Of R&D	704	4.2	2.7	23,200	893	4.0	3.1	24,300	1,234	4.5	4.0	26,300
Other than R&D	797	4.7	6.0	21,700	1,142	5.2	7.3	22,100	1,696	6.2	7.7	24,100
Of both	336	2.0	5.0	22,100	406	1.8	5.5	22,900	508	1.8	6.7	25,500
Teaching	7,504	44.3	9.4	17,000	9,480	42.9	10.4	18,200	10,396	37.8	11.5	19,500
Consulting	333	2.0	8.2	18,300	400	1.8	7.3	20,500	495	1.8	8.1	22,300
Sales/professional services	1,647	9.7	20.4	18,200	2,348	10.6	20.1	20,000	3,222	11.7	21.2	21,200
Other	641	3.8	9.2	(*)	822	3.7	11.0	(*)	1,652	6.0	12.9	(*)
No report	342	2.0	9.3	17,600	624	2.8	10.3	20,700	705	2.6	12.1	20,300

*No median computed for groups with fewer than 20 individuals reporting salary.
†Data not available.
NOTE: Percents may not add to 100 because of rounding. Median salaries computed for full-time employed civilians only.
SOURCE: National Science Foundation

BEST DOCUMENT AVAILABLE

Table B–22. Median annual salaries of doctoral scientists and engineers by field and sex: 1977

	Total	Men	Women
Total, all fields	$25,600	$26,000	$20,700
Physical scientists	26,600	26,800	21,200
Mathematical scientists	23,300	23,600	19,900
Computer specialists	25,800	26,100	20,800
Environmental scientists	25,800	26,000	19,700
Engineers	28,600	28,700	22,900
Life scientists	24,700	25,100	21,000
Psychologists	24,100	24,900	20,600
Social scientists	24,100	24,700	20,200

SOURCE: National Science Foundation.

Table B–23. Median annual salaries of doctoral scientists and engineers by field and type of employer: 1973, 1975, and 1977

Field	Educational institutions			Business and industry			Federal Government		
	1973	1975	1977	1973	1975	1977	1973	1975	1977
Total, all fields	$19,100	$21,400	$23,700	$23,300	$26,000	$29,900	$23,500	$26,300	$29,700
Physical scientists	18,300	21,100	23,600	22,700	25,900	29,900	23,400	26,000	29,700
Mathematical scientists	18,600	20,500	22,700	24,100	25,600	27,400	23,600	27,700	29,300
Computer specialists	21,200	22,700	24,400	22,300	24,100	26,700	22,200	25,000	30,500
Environmental scientists	18,800	21,000	23,600	22,600	26,200	28,600	23,800	27,500	30,700
Engineers	20,600	23,600	26,500	23,300	26,100	30,000	23,400	26,700	30,000
Life scientists	18,900	20,900	23,500	23,300	25,500	28,700	22,800	25,400	28,400
Psychologists	19,200	21,000	22,700	30,000	30,500	33,300	23,800	26,800	30,600
Social scientists	19,500	21,200	23,100	27,500	28,300	30,200	28,000	29,300	31,400

SOURCE: National Science Foundation.

Table B-24. Doctoral scientists and engineers by field and race: 1977

Field	White	Black	Asian
Total, all fields	270,300	2,800	15,700
Physical scientists	55,300	600	3,400
Mathematical scientists	13,600	100	700
Computer specialists	5,000	15	600
Environmental scientists	12,500	24	500
Engineers	39,600	100	4,900
Life scientists	70,200	800	3,900
Psychologists	32,800	500	300
Social scientists	41,200	700	1,400

NOTE: Detail may not add to totals because of rounding.
SOURCE: National Science Foundation

Table B-25. Doctoral scientists and engineers by type of employer, primary work activity, and race: 1977

Employer and work activity	White	Black	Asian
Type of employer			
Total	253,300	2,700	15,200
Business and industry	62,600	400	5,800
Educational institutions	146,100	1,800	7,300
Federal Government	19,400	300	800
Other[1]	25,300	200	1,300
Primary work activity			
Total	253,300	2,700	15,200
Research and development	108,400	1,000	9,500
Teaching	81,500	960	3,400
Other[2]	63,300	700	2,200

[1]Includes hospitals/clinics, nonprofit organizations, military, State and other government, other and no report.
[2]Includes consulting, sales/professional services, other, not employed, and no report.
NOTE: Detail may not add to totals because of rounding.
SOURCE: National Science Foundation

BEST DOCUMENT AVAILABLE

Table B-26. Projected changes in doctoral scientists and engineers: 1977-87

(Percents)

Field	National Science Foundation	Bureau of Labor Statistics
Total	47.1	49.4
Physical scientists	35.7	27.5
Mathematical scientists	40.0	35.7
Engineers	63.6	33.8
Life scientists	45.1	55.5
Social scientists	52.7	79.0

SOURCE: National Science Foundation

Table B-27. Percent of science/engineering doctorates in non-science/engineering employment:[1] projections

Field	National Science Foundation	Bureau of Labor Statistics
Total	17	14
Physical scientists	9	10
Mathematical scientists	21	30
Engineers	19	−9[2]
Life scientists	16	20
Social scientists	19	27

[1]For NSF, data show estimated non-S/E utilization as percent of labor force for 1987. For BLS, data pertain to estimates of Ph.D.'s in traditional jobs as percent of total Ph.D. employment in 1985.

[2]That is, the supply of engineering Ph.D.'s is projected to fall short of requirements.

SOURCE: National Science Foundation

Table B-28. Projected full-time labor force of doctoral scientists and enginers: 1982 and 1987

[In thousands]

Derivation of 1982 and 1987 labor force	Total	Physical sciences	Engineering	Mathematical sciences	Life sciences	Social sciences
	1982					
Employed full time in 1977	277	69	44	20	70	73
Full-time entrants, 1977–82	110	19	19	7	29	35
Graduates[1]	114	20	20	7	30	37
Part time or not seeking employment	−4	−1	—	—	−1	−2
Net migration	−6	—	−2	—	−2	−2
Immigration	10	3	3	1	2	2
Emigration	−16	−3	−5	−1	−4	−4
Attrition	−29	−5	−3	−2	−9	−9
1982 full-time labor force	352	83	58	25	88	97
	1987					
Full-time entrants, 1983–87	102	18	20	6	28	30
Graduates[1]	106	19	21	6	29	32
Part time or not seeking employment	−4	−1	—	—	−1	−2
Net migration	−5	—	−2	—	−2	−2
Immigration	8	3	2	1	1	1
Emigration	−13	−3	−4	−1	−3	−3
Attrition	−36	−6	−4	−3	−11	−12
1987 full-time labor force	412	95	72	28	103	113

[1]Corrected for field-switching

NOTE: Detail may not add to totals because of rounding.

SOURCE: National Science Foundation

BEST DOCUMENT AVAILABLE

Table B-29. Bachelor's and first-professional degrees awarded by field: 1960-78

Year	All fields	Science and engineering fields						All other fields[4]
		Total	Physical sciences[1]	Engineering	Mathematical sciences[2]	Life sciences	Social sciences[3]	
	Number							
1960	394,889	120,937	16,057	37,808	11,437	24,141	31,494	273,952
1961	401,784	121,660	15,500	35,866	13,127	23,900	33,267	280,124
1962	420,485	127,469	15,894	34,735	14,610	25,200	37,030	293,016
1963	450,592	135,964	16,276	33,458	16,128	27,801	42,308	314,628
1964	502,104	153,361	17,527	35,226	18,677	31,611	50,320	348,743
1965	538,930	164,936	17,916	36,795	19,668	34,842	55,715	373,994
1966	555,613	173,471	17,186	35,815	20,182	36,964	63,424	382,142
1967	594,862	187,849	17,794	36,188	21,530	39,408	72,929	407,013
1968	671,591	212,174	19,442	37,614	24,084	43,260	87,774	459,417
1969	769,683	244,519	21,591	41,553	28,263	48,713	104,399	525,164
1970	833,322	264,122	21,551	44,772	29,109	52,129	116,561	569,200
1971	884,386	271,176	21,549	45,387	27,306	51,461	125,473	613,210
1972	937,884	281,228	20,887	46,003	27,250	51,484	133,604	656,656
1973	980,707	295,391	20,809	46,989	27,528	59,486	140,579	685,316
1974	1,008,654	305,062	21,287	43,530	26,570	68,226	145,449	703,592
1975	987,922	294,920	20,896	40,065	23,385	72,710	137,864	693,002
1976	997,504	292,174	21,559	39,114	21,749	77,301	132,451	705,330
1977	993,008	288,543	22,618	41,581	20,729	78,472	125,143	704,465
1978	997,165	288,167	23,175	47,411	19,925	77,138	120,518	708,998
	As a percent of fields							
1960	100	31	4	10	3	6	8	69
1961	100	30	4	9	3	6	8	70
1962	100	30	4	8	4	6	9	70
1963	100	30	4	7	4	6	9	70
1964	100	31	4	7	4	6	10	69
1965	100	31	3	7	4	7	10	69
1966	100	31	3	6	4	7	11	69
1967	100	32	3	6	4	7	12	68
1968	100	32	3	6	4	6	13	68
1969	100	32	3	5	4	6	14	68
1970	100	32	3	5	4	6	14	68
1971	100	31	2	5	3	6	14	69
1972	100	30	2	5	3	6	14	70
1973	100	30	2	5	3	6	14	70
1974	100	30	2	4	3	7	14	70
1975	100	30	2	4	2	7	14	70
1976	100	29	2	4	2	8	13	71
1977	100	29	2	4	2	8	13	71
1978	100	29	2	5	2	8	12	71

[1]Including environmental sciences.
[2]Including statistics and computer specialities.
[3]Excluding history and including psychology.
[4]Including first-professional degrees such as M.D., D.D.S., D.V.M., and J.D. degrees.
NOTE: Percents may not add to 100 because of rounding.
SOURCE: National Center for Education Statistics and National Science Foundation, unpublished data.

BEST DOCUMENT AVAILABLE

Table B-30. Master's degrees awarded by field: 1960-78

Year	All fields	Science and engineering fields						All other fields
		Total	Physical sciences[1]	Engineering	Mathematical sciences[2]	Life sciences	Social sciences[3]	
	Number							
1960	74,497	20,012	3,387	7,159	1,765	3,751	3,950	54,485
1961	78,269	22,786	3,799	8,178	2,238	4,085	4,486	55,483
1962	84,889	25,146	3,929	8,909	2,680	4,672	4,956	59,743
1963	91,418	27,367	4,132	9,635	3,323	4,718	5,559	64,051
1964	101,122	30,271	4,567	10,827	3,603	5,357	5,917	70,851
1965	112,195	33,835	4,918	12,056	4,294	5,978	6,589	78,360
1966	140,772	38,083	4,992	13,678	5,610	6,666	7,737	102,689
1967	157,892	41,800	5,412	13,885	5,733	7,465	9,305	116,092
1968	177,150	45,425	5,508	15,188	6,081	8,315	10,333	131,725
1969	194,414	48,425	5,911	15,243	6,735	8,809	11,727	145,989
1970	209,387	49,318	5,948	15,597	7,107	8,590	12,076	160,069
1971	231,486	50,624	6,386	16,347	6,789	8,320	12,782	180,862
1972	252,774	53,567	6,307	16,802	7,186	8,914	14,358	199,207
1973	264,525	54,234	6,274	16,758	7,146	9,080	14,976	210,291
1974	278,259	54,175	6,087	15,393	7,116	9,605	15,974	224,084
1975	293,651	53,852	5,830	15,434	6,637	9,618	16,333	239,799
1976	313,001	54,747	5,485	16,170	6,466	9,823	16,803	258,254
1977	318,241	56,731	5,345	16,889	6,496	10,707	17,294	261,510
1978	312,816	56,237	5,576	17,105	6,421	10,711	16,514	256,579
	As a percent of all fields							
1960	100	27	5	10	2	5	5	73
1961	100	29	5	10	3	5	6	71
1962	100	30	5	11	3	6	6	70
1963	100	30	5	11	4	5	6	70
1964	100	30	5	11	4	5	6	70
1965	100	30	4	11	4	5	6	70
1966	100	27	4	10	4	5	6	73
1967	100	26	3	9	4	5	6	74
1968	100	26	3	9	3	5	6	74
1969	100	25	3	8	4	5	6	75
1970	100	24	3	7	3	4	6	76
1971	100	22	3	7	3	4	6	78
1972	100	21	3	7	3	4	6	79
1973	100	21	2	6	3	3	6	79
1974	100	19	2	6	3	3	6	81
1975	100	18	2	5	2	3	6	82
1976	100	17	2	5	2	3	5	83
1977	100	18	2	5	2	3	5	82
1978	100	18	2	5	2	3	5	82

[1]Including environmental sciences.
[2]Including statistics and computer specialities.
[3]Excluding history and including psychology.
NOTE: Percents may not add to 100 because of rounding.
SOURCE: National Center for Education Statistics and National Science Foundation, unpublished data.

BEST DOCUMENT AVAILABLE

Table B-31. Doctoral degrees awarded by field: 1965-78

Year	All fields	Science and engineering fields						All other fields[4]
		Total	Physical sciences[1]	Engineering	Mathematical sciences[2]	Life sciences	Social sciences[3]	
	Number							
1965	16,340	10,477	2,865	2,073	685	2,539	2,315	5,863
1966	17,953	11,456	3,058	2,299	769	2,712	2,618	6,497
1967	20,384	12,982	3,502	2,503	830	2,967	3,080	7,402
1968	22,916	14,411	3,667	2,847	970	3,501	3,426	8,505
1969	25,724	15,949	3,910	3,249	1,064	3,796	3,930	9,775
1970	29,475	17,731	4,400	3,432	1,222	4,163	4,514	11,744
1971	31,772	18,880	4,494	3,495	1,236	4,533	5,122	12,892
1972	33,001	18,940	4,226	3,475	1,281	4,505	5,453	14,061
1973	33,727	18,948	4,016	3,338	1,222	4,574	5,798	14,779
1974	33,000	18,316	3,696	3,144	1,196	4,407	5,873	14,684
1975	32,913	18,352	3,611	2,959	1,149	4,540	6,093	14,561
1976	32,923	17,832	3,442	2,791	1,003	4,480	6,116	15,091
1977	31,672	17,373	3,410	2,641	959	4,266	6,097	14,299
1978	30,850	17,034	3,234	2,423	959	4,361	6,057	13,816
	As a percent of all fields							
1965	100	64	18	13	4	16	14	36
1966	100	64	17	13	4	15	15	36
1967	100	64	17	13	4	15	15	36
1968	100	63	16	12	4	15	15	37
1969	100	62	15	13	4	15	15	38
1970	100	60	15	12	4	14	15	40
1971	100	59	14	11	4	14	16	41
1972	100	57	13	11	4	14	17	43
1973	100	56	12	10	4	14	17	44
1974	100	56	11	10	4	13	18	45
1975	100	56	11	9	3	14	19	44
1976	100	54	10	8	3	14	19	46
1977	100	55	11	8	3	13	19	45
1978	100	55	10	8	3	14	20	45

[1]Including environmental sciences.
[2]Including statistics and computer specialities.
[3]Including psychology.
[4]Excluding first-professional degrees such as M.D., D.D.S., D.V.M., and J.D.
SOURCE: National Academy of Sciences

Table B–32. Graduate school entry rates of science/engineering bachelor's-degree recipients: 1961–76

Academic year (fall)	All fields			Total science engineering			Physical sciences			Engineering		
	Bachelor's degrees	Enrollment for advanced degrees	Enrollment as percent of degrees	Bachelor's degrees	Enrollment for advanced degrees	Enrollment as percent of degrees	Bachelor's degrees	Enrollment for advanced degrees	Enrollment as percent of degrees	Bachelor's degrees	Enrollment for advanced degrees	Enrollment as percent of degrees
1961	401,800	217,500	54.1	121,700	67,500	55.5	15,500	12,200	79.0	35,900	21,600	60.1
1962	420,500	240,500	57.2	127,700	74,400	58.4	15,900	13,200	83.2	34,700	24,000	69.2
1963	450,600	270,800	60.1	136,000	84,700	62.3	16,300	14,700	90.2	33,500	27,400	81.9
1964	502,100	317,800	63.3	153,400	96,900	63.2	17,500	16,100	92.0	35,200	30,200	85.9
1965	538,900	358,900	66.6	164,900	106,600	64.6	17,900	16,800	93.7	36,800	32,500	88.4
1966	555,600	389,600	70.1	173,500	111,900	64.5	17,200	17,300	100.5	35,800	33,300	92.9
1967	594,900	428,000	72.0	187,800	114,800	61.1	17,800	17,200	96.9	36,200	33,700	93.2
1968	671,600	458,300	68.2	212,200	116,400	54.9	19,400	16,800	86.5	37,600	34,400	91.6
1969	769,700	494,400	64.2	244,500	126,500	51.7	21,600	16,800	77.8	41,600	36,600	88.1
1970	833,300	527,200	63.3	264,100	132,400	50.1	21,600	17,400	80.5	44,800	35,500	79.2
1971	884,400	528,200	59.7	271,200	124,800	46.0	21,500	16,700	77.3	45,400	30,700	67.6
1972	937,900	540,000	57.6	281,200	122,900	43.7	20,900	15,400	73.7	46,000	28,300	61.6
1973	980,700	561,900	57.3	295,400	121,500	41.1	20,800	14,700	70.6	47,000	28,800	61.2
1974	1,008,700	597,700	59.3	305,100	128,000	42.0	21,300	14,500	68.3	43,500	30,900	70.9
1975	987,900	648,000	65.6	294,900	132,200	44.8	20,900	14,900	71.5	40,100	32,400	81.0
1976	997,500	623,500	62.5	292,200	127,600	43.7	21,600	15,300	70.8	39,100	30,700	78.5

BEST DOCUMENT AVAILABLE

Table B–32. Graduate school entry rates of science/engineering bachelor's-degree recipients: 1961–76—Continued

Academic year (fall)	Mathematical sciences			Life sciences			Social sciences			All other fields		
	Bachelor's degrees	Enrollment for advanced degrees	Enrollment as percent of degrees	Bachelor's degrees	Enrollment for advanced degrees	Enrollment as percent of degrees	Bachelor's degrees	Enrollment for advanced degrees	Enrollment as percent of degrees	Bachelor's degrees	Enrollment for advanced degrees	Enrollment as percent of degrees
1961	13,100	7,900	59.8	23,900	10,600	44.3	33,300	15,300	45.9	280,100	150,000	53.5
1962	14,600	8,800	60.3	25,200	11,600	46.2	37,000	16,700	45.1	293,000	166,000	56.7
1963	16,100	10,100	62.6	27,800	13,000	46.9	42,300	19,500	46.0	314,600	186,100	59.2
1964	18,700	11,800	63.3	31,600	16,000	50.5	50,300	22,700	45.2	348,700	220,900	63.3
1965	19,700	13,500	68.6	34,800	18,000	51.6	55,700	25,800	46.3	374,000	252,300	67.5
1966	20,200	14,700	72.6	36,900	18,800	51.0	63,400	28,000	44.1	382,100	277,600	72.7
1967	21,500	15,100	70.2	39,400	18,800	47.7	72,900	29,900		407,000	313,300	77.0
1968	24,100	15,900	66.1	43,300	19,000	43.5	87,800	30,200	34.4	459,400	341,900	74.4
1969	28,300	17,800	63.1	48,700	21,000	43.2	104,400	34,200	32.8	525,200	367,900	70.0
1970	29,100	18,600	64.0	52,100	22,300	42.8	116,600	38,700	33.2	569,200	395,400	69.5
1971	27,300	16,900	62.0	51,500	22,900	44.4	125,500	37,700	30.1	613,200	403,300	65.8
1972	27,300	16,400	60.1	53,500	24,300	45.5	133,600	38,500	28.8	656,700	417,100	63.5
1973	27,500	15,000	54.6	59,500	24,500	41.2	140,600	38,500	27.4	685,300	440,400	64.3
1974	26,600	15,900	59.8	68,200	27,100	39.7	145,400	39,700	27.3	703,600	469,700	66.8
1975	23,400	15,100	64.6	72,700	28,600	39.3	137,900	41,100	29.8	693,000	515,800	74.4
1976	21,700	15,500	71.0	77,300	27,800	36.0	132,500	38,300	28.9	705,300	496,000	70.3

NOTE: Detail may not add to totals because of rounding.
SOURCE: National Center for Education Statistics.

Table B–33. Doctoral degrees awarded in science/engineering as a percent of science/engineering bachelor's degrees awarded seven years earlier: 1962–77

Degree year	Bachelor's degrees	Degree year	Doctoral degrees	Percent
1954–55	80,900	1961–62	7,200	9.0
1955–56	87,700	1962–63	8,100	9.2
1956–57	98,500	1963–64	9,000	9.2
1957–58	108,700	1964–65	10,300	9.4
1958–59	116,800	1965–66	11,300	9.7
1959–60	120,900	1966–67	12,800	10.6
1960–61	121,700	1967–68	14,100	11.6
1961–62	127,500	1968–69	15,600	12.4
1962–63	136,000	1969–70	17,600	13.0
1963–64	153,400	1970–71	18,500	12.0
1964–65	164,900	1971–72	18,400	11.2
1965–66	173,500	1972–73	18,600	10.7
1966–67	187,800	1973–74	17,900	9.5
1967–68	212,200	1974–75	17,800	8.4
1968–69	244,500	1975–76	17,300	7.1
1969–70	264,100	1976–77	16,900	6.4

SOURCE: National Center for Education Statistics and National Science Foundation, unpublished data.

Table B–34. Distribution of selected activities of 1976 science/engineering bachelor's-degree recipients in 1978

Employed by field	Total		Labor force		Total employed		Employed in S E		Employed in non-S E		Full-time graduate student	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Total, all fields	318,500	100.0	275,400	86.5	264,600	83.1	119,400	37.5	145,200	45.6	67,000	21.0
Scientists	271,400	100.0	229,700	84.6	219,200	80.8	80,600	29.7	138,700	51.1	64,300	23.7
Physical scientists[1]	25,300	100.0	20,500	80.9	19,500	76.9	13,800	54.6	5,600	22.3	8,700	34.3
Mathematical scientists[2]	21,700	100.0	19,900	91.4	19,400	89.2	13,700	63.2	5,600	25.9	3,100	14.4
Life scientists	78,500	100.0	62,400	79.6	59,800	76.2	28,100	35.8	31,700	40.4	23,700	30.2
Social scientists[3]	145,900	100.0	126,900	87.0	120,600	82.6	24,900	17.1	95,700	65.6	28,800	19.7
Engineers	47,100	100.0	45,700	97.2	45,400	96.5	38,900	82.6	6,500	13.9	2,700	5.7

[1]Includes environmental sciences.
[2]Includes statistics and computer specialities.
[3]Includes psychology.

NOTE: Detail may not add to totals because of rounding.
SOURCE: National Science Foundation.

BEST DOCUMENT AVAILABLE

Table B-35. Employed 1976 science/engineering graduates by field and level of degree, and field of employment in 1978

Field of degree	Total employed	Chemistry	Physics/ astronomy	Other physical sciences	Mathematical sciences	Computer specialities	Environmental sciences	Engineering	Life sciences	Psychology	Social sciences	Non-science/ engineering
	FIELD OF EMPLOYMENT											
	BACHELOR'S DEGREE											
Total, all fields	264,600	5,700	1,400	700	2,500	14,100	4,300	47,000	23,900	8,200	11,200	145,600
Chemistry	7,500	**3,700**	—	70	—	200	100	800	800	30	—	1,900
Physics/astronomy	2,900	80	**1,100**	100	20	100	60	800	100	40	—	500
Other physical sciences	1,200	—	—	**30**	70	100	100	300	—	—	—	600
Mathematical sciences	13,800	—	200	80	**2,100**	5,100	200	1,200	40	40	40	5,000
Computer specialities	5,600	—	—	—	—	**4,800**	—	100	—	—	—	700
Environmental sciences	7,800	100	—	200	—	200	**2,700**	1,200	400	—	400	2,700
Engineering	45,400	50	50	100	70	1,000	100	**37,100**	300	—	70	6,500
Life sciences	59,800	1,500	80	100	40	900	600	2,900	**21,100**	200	300	32,000
Psychology	39,800	—	—	—	300	500	200	1,400	700	**7,100**	500	29,200
Social sciences	80,800	300	—	—	—	1,200	100	1,300	600	800	**9,900**	66,500
	MASTER'S DEGREE											
Total, all fields	54,600	1,200	1,100	300	1,400	3,900	1,700	14,400	5,200	3,900	4,400	17,200
Chemistry	2,200	**900**	60	60	—	40	20	200	100	—	—	700
Physics/astronomy	2,100	50	**800**	—	20	300	90	400	70	—	40	300
Other physical sciences	400	10	—	**10**	—	60	—	60	40	10	20	100
Mathematical sciences	4,800	30	60	100	**1,300**	900	60	300	30	60	100	1,800
Computer specialities	1,900	—	—	—	—	**1,200**	—	400	—	—	—	400
Environmental sciences	2,200	—	20	80	—	70	**1,100**	200	60	—	50	600
Engineering	16,800	30	100	80	70	1,200	60	**12,500**	70	—	100	2,600
Life sciences	8,100	20	—	—	50	40	90	70	**4,700**	—	60	2,900
Psychology	5,000	—	—	—	—	—	—	—	—	**3,700**	50	1,200
Social sciences	11,200	—	—	—	—	70	300	200	40	100	**4,000**	6,500

NOTE: Detail may not add to totals because of rounding.
SOURCE: National Science Foundation, unpublished data.

Table B–36. Percent distribution of employed 1976 science/engineering graduates by field and level of degree, and field of employment in 1978

Field of degree	Total employed	Chemistry	Physics astronomy	Other physical sciences	Mathematical sciences	Computer sciences	Envromental sciences	Engineering	Life sciences	Psychology	Social sciences	Non-science engineering
	FIELD OF EMPLOYMENT											
	BACHELOR'S DEGREE											
Total, all fields	264,600	5,700	1,400	700	2,500	14,100	4,300	47,000	23,900	8,200	11,200	145,600
	Percent											
Chemistry	7.500	**49.3**	–	1.0	–	2.7	1.7	10.0	10.0	.3	–	25.3
Physics astronomy	2.900	2.8	**38.0**	4.3	.7	3.4	2.4	27.3	3.6	1.4	–	16.5
Other physical sciences	1.200	–	–	**2.7**	5.4	8.1	8.1	24.4	–	–	–	51.4
Mathematical sciences	13.800	–	1.1	.5	**15.0**	36.6	1.6	5.4	.3	.3	.3	36.0
Computer sciences	5.600	–	–	–	–	**85.8**	–	2.0	–	–	–	12.1
Environmental sciences	7.800	1.3	–	2.3	–	2.8	**34.9**	14.8	4.9	–	4.7	34.4
Engineering	45.400	.1	.1	.3	.2	2.3	.3	**81.8**	.6	–	.2	14.4
Life sciences	59.800	2.5	.1	.2	.1	1.5	1.1	4.9	**35.3**	.3	.5	53.5
Psychology	39.600	–	–	–	.7	1.2	.5	3.6	1.7	**17.7**	1.2	73.4
Social sciences	80.800	.3	–	–	–	1.5	.2	1.6	.8	1.0	**12.3**	82.3
	MASTER'S DEGREE											
Total, all fields	54.600	1.200	1.100	300	1.400	3.900	1.700	14.400	5.200	3.900	4.400	17.200
	Percent											
Chemistry	2.200	**42.9**	2.9	2.9	–	1.9	1.0	10.7	6.1	–	–	31.6
Physics astronomy	2.100	2.6	**39.3**	–	.9	12.8	4.3	21.3	3.4	–	1.7	13.7
Other physical sciences	400	1.9	–	**3.6**	–	17.7	–	15.7	11.0	3.0	6.6	40.3
Mathematical sciences	4.800	.6	1.3	2.3	**27.1**	18.9	1.1	6.5	.6	1.2	2.0	38.4
Computer sciences	1.900	–	–	–	–	**61.8**	–	19.1	–	–	–	19.2
Environmental sciences	2.200	–	.9	3.8	–	3.1	**50.4**	8.8	2.9	–	2.2	27.8
Engineering	16.800	.2	.6	.5	.4	7.2	.4	**74.4**	.4	–	.7	15.2
Life sciences	8.100	1.9	–	–	.6	.5	1.2	.9	**58.3**	–	.8	36.0
Psychology	5.000	–	–	–	–	–	–	–	–	**74.6**	.9	24.5
Social sciences	11.200	–	–	–	–	.6	2.6	1.7	.4	1.0	**35.3**	58.3

NOTE: Totals add horizontally and may not add to 100 percent because of rounding.
SOURCE: National Science Foundation, unpublished data.

BEST DOCUMENT AVAILABLE

Table B–37. Immigrant scientists and engineers by continent of last permanent residence: FY 1966–77[1]

Region	Total	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977
	Permanent immigrants												
Total	115,500	7,200	12,500	13,000	10,300	13,300	13,100	11,300	6,600	6,000	6,900	7,500	7,800
Europe	29,600	2,900	4,500	5,000	2,600	2,800	2,000	1,700	1,300	1,300	1,600	2,000	1,900
Asia	58,800	2,000	4,700	4,000	4,900	7,500	8,700	7,600	3,900	3,400	4,000	4,200	3,900
Africa	4,700	100	200	400	600	1,000	500	400	300	200	300	300	300
South America	4,200	400	500	600	400	300	400	300	200	200	200	200	400
North and Central America	17,100	1,700	2,500	2,900	1,600	1,600	1,400	1,200	800	700	700	800	1,200
Other	1,400	100	200	200	100	200	100	100	100	100	100	(2)	100
	Temporary immigrants												
Total	53,900	5,500	5,400	5,600	5,400	6,100	2,400	2,700	4,100	4,900	5,500	6,300	NA
Europe	23,200	2,300	2,500	2,600	2,400	2,700	1,100	900	1,700	1,800	2,500	2,700	NA
Asia	12,700	1,500	1,400	1,600	1,300	1,300	400	900	1,000	1,200	1,100	1,000	NA
Africa	2,300	300	200	200	200	200	100	100	200	200	200	400	NA
South America	5,200	500	400	400	500	700	200	300	400	500	500	800	NA
North and Central America	8,900	700	700	700	800	1,000	400	400	700	1,100	1,100	1,300	NA
Other	1,900	200	200	200	200	200	100	100	100	200	200	200	NA

[1]While these data represent last permanent residencies, permanent immigrant visas are granted on the basis of the country of birth. The resultant pattern of immigration, however, is not significantly different if counted by country of birth.
[2]Less than 100 people.
NA: Not available.
NOTE: Detail may not add to total because of rounding.
SOURCE: National Science Foundation based on data of the U.S. Immigration and Naturalization Service, Department of Justice.

Table B-38. Occupational mobility: 1972 scientists and engineers as employed in 1978

1972 occupation	Total	Engineers	Computer specialists	Mathematical scientists	Physical scientists	Environmental scientists	Biological scientists	Psychologists	Social scientists	Administration/ management	Non-science/ engineering
	1978 occupation										
	Percent										
Total, all fields	831,000	48.9	6.2	2.2	7.8	2.4	6.4	2.5	2.7	14.1	6.9
Engineers	510,000	**77.1**	1.1	.1	.7	.1	.2	.1	—	15.1	5.5
Computer specialists	67,000	7.2	**64.9**	1.1	.5	.5	.1	.2	.3	19.7	5.7
Mathematicians	28,000	7.8	6.8	**58.4**	1.3	.4	.5	.1	1.8	12.5	10.5
Physical scientists	80,000	5.2	1.2	.3	**70.8**	1.8	3.0	—	.1	11.3	6.4
Environmental scientists	21,000	3.3	.5	.2	3.7	**78.6**	3.1	.1	.3	6.8	3.4
Biological scientists	68,000	1.2	.1	.3	3.9	.9	**71.7**	.2	.7	9.0	12.0
Psychologists	24,000	.1	.1	.3	.1	—	.6	**79.6**	1.5	7.1	10.6
Social scientists	32,000	.5	.3	1.3	.1	.2	.7	1.9	**62.8**	15.3	17.0

SOURCE: National Science Foundation

Table B-39. Supply of scientists and engineers: 1976, 1978, and 1980

Field	1976	1978	1980
Total	2,705,800	2,741,500	2,980,100
Physical scientists[1]	280,600	335,400	367,100
Mathematical scientists[2]	110,200	345,300	373,200
Engineers	1,375,200	1,396,400	1,491,900
Life scientists	314,100	327,600	375,200
Social scientists[3]	237,200	336,800	372,600

[1]Includes environmental scientists.
[2]Includes computer specialists.
[3]Includes psychologists.
SOURCE: National Science Foundation, unpublished data

BEST DOCUMENT AVAILABLE

other science resources publications

Science Resources Studies Highlights

	NSF Number	Price
R&D Funds		
"National R&D Spending Expected to Reach $67 Billion in 1981"	80-310	-----
"Federal Obligations to Universities and Colleges Continued Real Growth in FY 1978"	80-303	-----
"Doctoral Institutions Report 6% Real Increase in R&D Expenditures in FY 1978"	80-301	-----
"Greatest Increase in 1978 Industrial R&D Expenditures Provided by 14% Rise in Companies' Own Funds"	80-300	-----
"Real Growth Unlikely in 1980 Federal R&D Funding"	79-319	-----
"Total Federal R&D Growth Slight in 1980 But Varies by Budget Function"	79-324	----
S/E Personnel		
"Academic Employment of Scientists and Engineers Increased 4% in Doctorate Institutions in 1979"	80-309	-----
"Graduate Science Enrollment in Doctorate-Granting Institutions Leveled off in 1978"	79-321	-----
"Manufacturing Industries with High Concentration of Scientists and Engineers Lead in 1965-77 Employment Growth"	79-307	-----
"Decline in Recent Engineering Doctoral Faculty Continues in 1978"	79-301	-----
"Hiring of Science and Engineering Faculty by 2- and 4-Year Colleges"	78-309	-----
"Utilization of Science and Engineering Doctorates in Industrial Research and Development"	78-301	-----

Detailed Statistical Tables

	NSF Number	Price
R&D Funds		
Research and Development in Industry, 1978. Funds, 1978; Scientists and Engineers, January 1979	80-307	-----
Research and Development in State and Local Governments, Fiscal Year 1977	79-327	-----
Academic Science: R&D Funds, Fiscal Year 1978	79-320	-----
Federal Funds for Research and Development, Fiscal Years 1978, 1979, and 1980, Volume XXVIII	79-318	-----
S/E Personnel		
Employment of Scientists, Engineers, and Technicians in Manufacturing Industries, 1977	80-306	-----
Academic Science: Scientists and Engineers, Janaury 1979	79-328	-----
Academic Science: Graduate Enrollment and Support, Fall 1978	79-316	-----

Reviews of Data on Science Resources

R&D Funds		
No. 35. "State and Local Government R&D Expenditures, FY 1977"	80-302	$1.25
No. 33. "U.S. Industrial R&D Spending Abroad"	79-304	$0.70
S/E Personnel		
No. 34. "Sex and Ethnic Differentials in Employment and Salaries Among Federal Scientists and Engineers"	79-323	$1.00

Reports

R&D Funds		
Federal Funds for Research and Development, Fiscal Years 1978, 1979, and 1980, Volume XXVIII	80-315	In press
Federal Support to Universities, Colleges, and Selected Nonprofit Institutions, Fiscal Year 1978	80-312	$5.50
S/E Personnel		
Employment Patterns of Academic Scientists and Engineers, 1973-78	80-314	In press
Composite		
Academic Science, 1972-77: R&D Funds, Scientists and Engineers, and Graduate Enrollment and Support	80-313	$4.25
National Patterns of Science and Technology Resources, 1980	80-308	$3.25

BEST DOCUMENT AVAILABLE